Catalogue
2015–2016

HARVEY MUDD COLLEGE

Harvey Mudd College, a member of The Claremont Colleges, is a small, coeducational, independent, residential liberal arts college of engineering, science and mathematics. Inquiries about admission may be addressed to:

Office of Admission
Harvey Mudd College
301 Platt Boulevard
Claremont, California 91711

Telephone: 909.621.8011
Fax: 909.607.7046
E-mail: admission@hmc.edu

Consult the College website, www.hmc.edu,
for further information.

STATUS OF CATALOGUE

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The official version of the Harvey Mudd College Catalogue is updated yearly and resides on the World Wide Web. See www.hmc.edu/catalogue/index.html. Consult the College website (www.hmc.edu) for further information about the College.

Catalogue produced by the Office of Communications and Marketing

HARVEY MUDD COLLEGE CATALOGUE 2015–2016

HARVEY MUDD COLLEGE seeks the nation's brightest men and women to prepare them for leadership roles in an increasingly complex world. The College graduates engineers well-trained in the sciences, scientists with a knowledge of engineering, and mathematicians familiar with both science and engineering. The College emphasizes the humanities and social sciences so that its graduates will understand the impact of their work on society.

"Technology divorced from humanity is worse than no technology at all."
—Harvey Mudd College Founding Trustees

ACCREDITATION

Harvey Mudd College is accredited by the Accrediting Commission for Senior Colleges and Universities of the Western Association of Schools and Colleges (WASC), 985 Atlantic Avenue, Suite #100, Alameda, Calif., 94501; phone: 510.748.9001; www.wascsenior.org.

Since 1962, the Department of Engineering has been accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

STATE OF CALIFORNIA INSTITUTIONAL COMPLAINT PROCESS

An individual may contact the Bureau for Private Postsecondary Education for review of a complaint. The bureau may be contacted at 2535 Capitol Oaks Drive, Suite 400, Sacramento, CA 95833, www.bppe.ca.gov, email: bppe@dca.ca.gov, phone: 916.431.6959, fax: 916.263.1897.

EQUAL OPPORTUNITY AND NONDISCRIMINATION STATEMENT

Harvey Mudd College is committed to promoting and maintaining a learning and work environment that offers equal opportunity to faculty, staff and students and to all applicants for employment.

As part of its mission, the College is committed to:

- Complying with applicable federal, state and local equal opportunity laws and regulations
- Prohibiting unlawful discrimination or harassment in employment decisions and any of its employment policies, procedures and practices; admission policies; educational programs; scholarship and loan programs; and other College-administered programs and activities because of a person's race, color, religion, national origin, ethnic origin, ancestry, citizenship, sex (including pregnancy, childbirth, or related medical conditions), sexual orientation, gender (including gender identity and expression), marital status, age, physical or mental disability, medical condition, genetic characteristics, veteran status, or any other characteristic protected by applicable law. The College also prohibits discrimination and harassment based on the perception that anyone has any of these characteristics or is associated with a person who has, or is perceived as having, any of these characteristics. Consistent with state and federal law, reasonable accommodation will be provided to persons with disabilities and/or to accommodate religious practices.
- Advising employees and students of their rights to refer violations of this policy statement to their supervisor, College administration, or the Human Resources Office without intimidation or retaliation for exercising such rights.

The following persons have been designated as Title IX and Section 504 Compliance Coordinators and handle inquiries and concerns regarding the Colleges' equal opportunity and nondiscrimination policies, affirmative action program and accommodation requests:

- Faculty, staff & applicants for employment—Assistant Vice President for Human Resources, 909.621.8512
- Students—Dean of Students, 909.621.8301

For the full text of the nondiscrimination/harassment policy, please contact the Division of Student Affairs at 909.621.8125.

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INTRODUCTION

Harvey Mudd College seeks high-ability students with the potential to develop thoughtful and creative solutions to the world's challenging problems. Those who attend Harvey Mudd learn that technology divorced from humanity is worse than no technology at all. They commit to intellectual honesty. They learn humility. And they leave with a broad scientific and technological perspective that is applicable to many professions.

UNDERGRADUATE FOCUS

The opportunities offered by Harvey Mudd's exclusive undergraduate focus give the College's students access to some of the top undergraduate engineering, science and mathematics faculty in the country. More than 95 percent of all faculty (full-time, part-time and instructors) hold a PhD, and courses taught by graduate students are extremely rare. Students enjoy a faculty dedicated to their education. They study and work in facilities that are comparable to what graduate students enjoy at research universities. Students at Harvey Mudd College learn both theory and practice. All students conduct research or do engineering design; all have the opportunity to work on the real-world problems of corporate and not-for-profit clients through the College's Clinic Program. These opportunities for hands-on learning give Harvey Mudd College graduates an advantage that has resulted in a high placement rate of its job-seeking graduates. Harvey Mudd also is an outstanding setting in which to prepare for an advanced degree.

Additionally, Harvey Mudd College recognizes the importance of preparing its graduates to live and work in a multicultural world. Students have the opportunity to participate in a community that values diversity and promotes cultural competence. The social environment is also shaped by an Honor Code that sets a tone of trust and collaboration and minimizes the intense competition that is often the by-product of bringing together exceptionally accomplished individuals.

HISTORICAL OVERVIEW

Harvey Mudd College was founded in 1955 and began operations in the fall of 1957, less than one month before Sputnik I launched the Space Age, making technical education a priority in the United States. Forty-eight students and seven faculty were the pioneers who shaped this unique, highly selective institution born of the generosity of businessman and philanthropist Harvey S. Mudd and the vision of Joseph B. Platt, the nuclear physicist who served as the College's first president. Harvey Mudd College became the fifth autonomous member of a much larger center of learning, The Claremont Colleges, an affiliation that broadens both academic and social opportunities for its students.

COLLEGE MISSION

The founders of Harvey Mudd College drafted a challenging mission statement in 1956 that continues to guide the Harvey Mudd faculty, administration and students:

> **Harvey Mudd College seeks to educate engineers, scientists and mathematicians well versed in all of these areas and in the humanities and social sciences so that they may assume leadership in their fields with a clear understanding of the impact of their work on society.**

Harvey Mudd College pioneered—and put into practice—the idea of relating human needs to engineering and science education. It was able to do so because, as a new institution, it had no particular tradition to uphold or other barriers to innovation. And the school's innovation and spirit of educational adventure—qualities that attract superior people—

appealed to new faculty, staff and students. Ever since its founding, the College's faculty has consisted of top-flight professionals—humanists who are not dissuaded by technology and engineers and scientists who have an abiding faith in liberal learning.

DEDICATED FACULTY

All of Harvey Mudd College's full-time faculty have PhDs or a terminal degree in their field of study, and all are engaged in research. Each faculty member's focus, however, is teaching the approximately 820 students at the College. Upper-division classes and laboratory sections average between 10 and 15 students. Faculty-student interaction is particularly good as students take advantage of the extensive research and design opportunities.

A PROVEN CURRICULUM

In the beginning, the courses and curriculum of Harvey Mudd College were formulated under a grant from the Carnegie Corporation and featured a rigorous Core designed to graduate engineers, scientists and mathematicians with grounding in all of these fields as well as an understanding of their social context. This Core is still at the heart of the modern curriculum that fully integrates the humanities and social sciences. While the original Core has been modified on occasion throughout the years since 1957, the founders' vision for a broad foundation for future work continues to be a hallmark of a Harvey Mudd education and is reflected in the most recent Core revision, implemented in fall 2010. Now, as at the institution's inception, all Harvey Mudd College students receive general education in the humanities, social sciences and the arts (more than a quarter of all course work, more courses, in fact, than at any engineering college in the United States) and basic work in biology, computer science, chemistry, engineering, mathematics and physics—the departmental major programs that the College offers. Students may also design individual programs of study outside of these majors, or major in an area of study offered at one of the other Claremont Colleges.

EXPERIENTIAL LEARNING

Harvey Mudd College is widely recognized for its programmatic innovation, excellence and rigor. A recipient of the National Science Foundation's prestigious Award for the Integration of Research and Education, Harvey Mudd College has long recognized the importance of collaborative student-faculty research, setting aside nearly $3 million annually for this purpose. *U.S. News & World Report* has consistently ranked Harvey Mudd as one of the best undergraduate engineering programs nation, with 40 percent of recent graduates majoring in that field. Harvey Mudd surpasses nearly every other college in the United States in the percentage of its graduates that go on to earn PhDs.

Harvey Mudd offers undergraduates unique, hands-on laboratory and field experience usually reserved for graduate students. Anchored by a research-supportive curriculum, students pursue research during their entire time at Harvey Mudd. They collaborate with faculty both during the academic year and in the summer through Harvey Mudd's Summer Undergraduate Research Program. In addition, several academic majors require senior research.

Harvey Mudd professors believe research is an extremely powerful teaching tool that leads to students' disciplinary learning and professional and personal growth well beyond traditional classroom settings. Students and faculty collaborate on many projects that are presented jointly at professional scientific conferences and in peer-reviewed journals. Students and faculty are frequently honored for this work with distinguished national awards.

Clinic Program—The Clinic Program, an internationally recognized hallmark of Harvey Mudd College, engages juniors and seniors in the solution of real-world, technical problems for industrial clients. Founded as an innovation in engineering education in 1963, this program has been expanded to other Harvey Mudd academic departments and has been copied by institutions worldwide. Harvey Mudd's engineering, mathematics, physics and computer science departments each conduct Clinic projects that draw upon the unique talents of our students and faculty advisors. Since Clinic was developed at Harvey Mudd College, more than 450 organizations have participated, and Harvey Mudd students have completed more than 1,500 projects.

Students work in groups of four or five under the guidance of a student project manager (team leader), a faculty advisor and a liaison from the sponsoring organization. Projects begin in September, involve about 1,200 to 1,500 work hours and are completed the following May. The sponsor's liaison outlines the project requirements, approves the team's proposal for accomplishing the work and receives weekly progress reports. In most cases the student team visits the sponsoring company during the first month and typically provides the results in a presentation to senior officials at the end of the project. Clinic teams present their research and/or designs during public forums held on campus and submit final written reports to the sponsoring organization upon completion of the project. Sponsors retain full rights to all intellectual property developed by the team.

Clinic is the centerpiece of the professional practice component of the College's curriculum. Sponsors pay a fixed fee for student teams to work on current problems that the company or agency needs solved. The objective is to produce useful results on an open-ended, authentic project to the client's satisfaction within the constraints of time and budget. The students do the work; the faculty advises, coaches and evaluates; and the client informs, guides and accepts or rejects the results. This time-tested program produces outstanding solutions for the vast majority of clients. Companies often apply for patents from the results of Clinic and the students assist in the patent process.

Built upon this extraordinary collaboration, the **Global Clinic Program** supports long-term sponsored engineering and science projects in which teams of Harvey Mudd students collaborate with teams of students from partnering schools all over the world. Students work on international team projects with members from different countries, cultures and institutional backgrounds, with different disciplinary interests and languages, but with a common unifying purpose and overarching project goals. The Global Clinic students make a series of presentations and written progress reports during the year, honing their technical writing and public speaking skills.

Global Clinic projects run for nearly one year—part of a summer plus one full academic year. Harvey Mudd students travel to the partner institution for an intensive multi-week program. Students from the partner university visit Harvey Mudd for a similar period of time during the summer or academic year. The student teams remain in weekly contact with each other during the academic year via email, teleconference and videoconference and with the sponsor liaisons via a weekly multi-conference call. Faculty members from each institution are appointed to guide the teams, monitoring progress and assisting with facilitating team communications. The faculty members work cooperatively to ensure that the academic goals for the students are met, including establishment of the summer curriculum.

Every Clinic and Global Clinic project is formally presented at a year-end event called Projects Day.

Research—Research is an integral part of the education of all students at Harvey Mudd College. The ability to conduct original investigations, to plan an approach to a problem and to see it through are essential to success in any scholarly endeavor. Time is set aside during the spring semester to celebrate the work of Harvey Mudd students as they present their original projects in design or research. Whether this work is done as an individual research project with a faculty ad-

visor or as part of a class project, the emphasis is on the students' own achievements. All Harvey Mudd students learn how to find, evaluate and synthesize information, using the most modern approaches to information technology. They are inspired to think of what is not known, not just what is known and to believe in their own questions and vision. They are encouraged to be competent as well as creative and confident.

Whereas research universities may struggle with ways to simulate the research experience for large numbers of students, Harvey Mudd faculty enable each one to experience the real thing. At Harvey Mudd, all students are full research participants; they are collaborators, not technicians. They conceptualize their research problems, access, review and synthesize relevant literature, design experiments and instrumentation, present written and oral research proposals and conclude their experience with a professional-quality, written thesis or project report and a public presentation. In addition to academic-year research, summer research opportunities engage students in 10 weeks of full-time research. More than 200 Harvey Mudd students pursue research projects each summer alongside more than 40 faculty members in biology, chemistry, computer science, engineering, mathematics and physics.

Students with meaningful research or Clinic experience have a competitive edge for top graduate schools and employment opportunities.

GRADUATE SUCCESS

The curriculum developed by Harvey Mudd College is effective—the proof is in the College's graduates. About three out of four eventually enter graduate schools, most in the top graduate programs in their fields, be it at Harvard, Johns Hopkins, MIT, Caltech, Yale, Stanford, Berkeley or other prestigious graduate schools. Eventually, most graduates go to work in industry, typically for firms such as Boeing, ESRI, Fair Isaac, Microsoft, Northrop-Grumman and Raytheon. Harvey Mudd graduates far more than its share of leaders in the pure and applied sciences. Within five years of graduation, alumni have usually reached such jobs as project engineer, research scientist and systems engineer. Those out more than five years are more likely to be chief engineers, division managers, senior scientists or even vice-presidents or general managers. An increasing number are entrepreneurs and are founding their own companies—some while still in school.

Many Harvey Mudd College alumni with advanced degrees work for "think tanks" or industrial research centers like RAND, The Aerospace Corporation, Bell Laboratories, IBM's Watson Research Center, the Jet Propulsion Laboratory, Lawrence Berkeley National Laboratory and NASA. Others are on the faculties of Yale, MIT, the University of California (Berkeley, Davis, Los Angeles, San Diego, Santa Cruz), Columbia University, the University of Washington, Dartmouth, Purdue, Claremont McKenna College and Harvey Mudd College—and not all teach engineering, mathematics and science. Included among our graduates are doctors in small towns and at research hospitals like the Mayo Clinic, artists, vintners, entrepreneurs, economists, historians, philosophers, oceanographers, actuaries and even two astronauts. Harvey Mudd College graduates are able to seek out satisfying places for themselves in a wide variety of fields.

HOME TO TOP STUDENTS

The Harvey Mudd College student body of approximately 820 students come from many different places and backgrounds, but they are alike in one way: They have a deep dedication to engineering, science and mathematics and are also interested in the role of these fields in society. More than that, they are good in these fields, and they like to be around others who share their interests. They spend a great deal of time in classrooms and laboratories, in conference with faculty members and in study—and like most of their work. They make time to participate in college and community life through volunteer service work, student government or student publications. They compete on athletic teams or participate in club sports. They enjoy going to

concerts, art exhibits and parties. Many play musical instruments and participate in Claremont Colleges performance groups. They are involved and engaged students who are intellectually gifted with a strong ability in engineering, science and mathematics.

CAMPUS FACILITIES

The Harvey Mudd College campus is a pleasant combination of beauty and efficiency. The buildings—residence halls, dining hall, classrooms, office buildings, laboratories and athletic center—are of a single, carefully planned architectural design, and the grounds have many tree-shaded paths, grassy slopes, flower beds, patios and plazas. Of course, the vast central facilities of The Claremont Colleges are open to everyone at Harvey Mudd College.

The Harvey Mudd College campus includes:

Residence Halls—Living accommodations for students are provided in nine residence halls: Mildred Mudd, West, North, Marks, Atwood, Case, Linde, Sontag and Drinkward. North Hall and Mildred Mudd Hall constitute the Seeley W. Mudd Memorial Quadrangle. Marks, Atwood, Case, Linde, Sontag and Drinkward residence halls are named in honor of David X. Marks, J.L. Atwood, Florence H. and Gerald R. Case, Ronald and Maxine Linde, Frederick ('64) and Susan (POM '64) Sontag, and Wayne ('73) and Julie Drinkward respectively.

Joseph B. Platt Campus Center—This two-story building was named for the founding president. The Campus Center houses many student services, including the Division of Student Affairs (Residential Life, Health and Wellness, Student Activities, Academic Affairs, Career Services, Institutional Diversity, Community Engagement), Study Abroad, the Registrar, and Facilities and Maintenance. The facility also includes a mailroom, lounge, study areas, music practice rooms, Jay's Place (a late-night dining and gathering place in memory of Jay Wolkin '99), offices for student organizations and the Green Room, a large meeting area.

Hoch-Shanahan Dining Commons—Completed in 2005, this dining facility, certified under LEED (Leadership in Energy and Environmental Design) guidelines, can hold 466 diners. It is home to the Aviation Room, which celebrates the College's former Bates Aeronautics Program and its graduates, and has a number of meeting rooms and patio areas. The building was named for trustees Richmond J. Hoch '63 and his wife, Diane, and R. Michael Shanahan and his wife, Mary.

The Norman F. Sprague Memorial Building—The building houses a digital Learning Studio on the first floor that includes classroom space with flexible furniture and laptops, a large area for individual and group work with desktop computers and lounge seating, as well as a group work area. The offices of Computing Information Services are on the fifth floor, the Dean of the Faculty offices and the Aeronautical Library Special Collections are on the fourth floor, and work spaces for the Computer Science and Mathematics departments are located on the second and third floors, respectively. The building was a gift of Dr. and Mrs. Norman F. Sprague Jr. in memory of Dr. Sprague's father.

Kingston Hall—This two-story building, a gift of Mrs. Fredrick C. Kingston in memory of her husband, houses administrative offices including College Advancement and Business Affairs.

R. Michael Shanahan Center for Teaching and Learning—This 70,000-square-foot academic building provides flexible and technologically advanced classrooms, lecture halls, faculty offices and public spaces. It is also home to the Office of the President, the Office of Admission and Financial Aid, Academic Excellence and the Writing Center. The building is named in honor of R. Michael Shanahan, former board of trustees chair, for his and his wife, Mary's, many contributions to the College.

The Parsons Engineering Building—Named in honor of Ralph M. Parsons, this three-story building houses the Department of Engineering, the Engineering Clinic and the Department of Humanities, Social Sciences, and the Arts.

The F.W. Olin Science Center—A gift of the F.W. Olin Foundation, this three-story building, completed in 1992, houses the departments of Biology and Computer Science, instructional facilities, and research and teaching labs.

The Jacobs Science Center—A gift of Dr. and Mrs. Joseph J. Jacobs, this three-story building houses offices and laboratories for the departments of Chemistry and Physics.

W.M. Keck Laboratories—A four-story building developed with a gift from the W.M. Keck Foundation, this facility houses a portion of the departments of Chemistry and Physics, classrooms and laboratories.

Beckman Hall—Built with a gift from the Arnold and Mabel Beckman Foundation, this facility houses classrooms, laboratories, computer facilities for computer science, biology and other departments, and a 75-seat auditorium.

Galileo Hall—This facility contains a concourse of workshops for the fabrication of instructional and research apparatus. The facility was named for the Galileo Society, now called the Legacy Society.

Hixon Court—In front of Galileo Hall is a stunning European fountain and koi pond, a gift from the Alexander Hixon family.

Linde Activities Center—The Linde Activities Center provides a central recreation area for the Harvey Mudd community. It houses a full-length basketball court and is also suitable for volleyball, badminton and special events. The center also has a computing lab, an aerobics workout area, a fitness area with a full range of conditioning equipment, shower and locker facilities, a lounge area equipped with a big-screen television and two large multipurpose rooms.

INFORMATION TECHNOLOGY

Harvey Mudd College provides extensive computing resources to the campus community; many of them are managed or provided by Computing and Information Services (CIS), including:

- The Learning Studio in Sprague
- The Linde Activities Center (LAC) computing lab
- Shanahan Center, Room 1443 (beside the living room)
- An equipment loan program (laptops, tablets, projectors)
- Networked printers throughout the campus
- The wireless network
- The Sakai learning management system (housed at Pomona College)
- The Student Portal
- Google Apps for Education (g.hmc.edu)
- Audiovisual support for classrooms and events
- The Help Desk in the Learning Studio (Monday through Friday, 8 a.m. to 5 p.m.)

For details about these and other services, please visit the CIS website, hmc.edu/cis. CIS also maintains an IT News site at www5.hmc.edu/ITNews/.

The Help Desk is the first point of contact for all CIS services. The staff can assist with hardware and software installation, configuration, troubleshooting, repair or advice. Students may visit in person in the Learning Studio in Sprague or contact the Help Desk via email helpdesk@hmc.edu or via phone at 909.607.7777.

Students at The Claremont Colleges abide by the Claremont-wide acceptable use policy, located at hmc.edu/use-policy. Use of Harvey Mudd information technology resources constitutes acceptance of the policy.

CENTRAL TO MOUNTAINS, OCEANS, DESERTS

The College is in Claremont, about 35 miles east of Los Angeles, in a suburban area that was once broad stretches of citrus groves. It is at the foot of Mount San Antonio (Mount Baldy), the highest peak in the San Gabriel Range—10,064 feet.

Claremont's population of about 35,000 live in well-tended homes on tree-covered streets. Freeways provide easy access to desert wilderness areas, Pacific Ocean beaches, the local mountains (snow-covered in the wintertime), Colorado River country, Pasadena (home of the Rose Parade), Disneyland, Knott's Berry Farm, San Diego and its wilderness and marine parks, Los Angeles and the many attractions of Hollywood—all within a two-hour drive.

THE CLAREMONT COLLEGES

From the beginning, Harvey Mudd College drew great strength from its membership in The Claremont Colleges, currently five small, independent colleges and two graduate institutions. They are—in order of founding—Pomona College (1887), The Claremont Graduate University (1925), Scripps College (1926), Claremont McKenna College (1946), Harvey Mudd College (1955), Pitzer College (1963) and the Keck Graduate Institute of Applied Life Sciences (1997).

Each of the five undergraduate colleges has a four-year academic program leading to its own bachelor's degree. Each has its own campus, its own students and faculty, and its own distinctive style. Yet the campuses adjoin, and the colleges open their courses to one another's students and cooperate in sponsoring joint academic and extracurricular programs. Together, they provide students with facilities and services comparable only to a premier university.

With a combination of more than 6,300 students and nearly 700 faculty members, the colleges generate an endless variety of intellectual, cultural, and social activities. Guest speakers, symposia and conferences are frequent, and there are numerous concerts, art exhibits, film series and theater productions.

The assets of The Claremont Colleges total more than $4.8 billion, including substantial endowments in all of the colleges, more than 175 buildings, and 550 acres of land—320 now occupied and 230 reserved for colleges and professional schools that may be founded in the future.

Pomona College, founded in 1887, is an independent, coeducational liberal arts college with approximately 1,600 students. It offers 47 majors in the humanities, natural sciences, social sciences and fine arts, leading to the bachelor of arts degree. The founding member of The Claremont Colleges, Pomona makes a number of its programs and facilities available to all Claremont students. The Pomona College Theatre and Dance Department offers instruction and performance opportunities to interested students from all the campuses. The Pomona College Symphony Orchestra and other instrumental and choral ensembles also invite other Claremont Colleges students to audition. Oldenborg Center for Modern Languages and International Relations, in addition to sponsoring a wide array of intercultural events, provides a setting for daily foreign language practice at language lunch tables. The Pomona College Museum of Art mounts temporary and student exhibitions for The Claremont Colleges community.

Claremont Graduate University (CGU) (1925) awards master's and doctoral degrees in 25 academic and professional fields. It has about 2,200 students and a core faculty of approximately 138, supplemented by more than 200 faculty from the undergraduate Claremont Colleges and affiliated institutions. Superior undergraduate students at The Claremont Colleges may work simultaneously toward the satisfaction of the undergraduate degree requirements and a master's degree. Applicants must be recommended by their respective colleges and usually enter the program at the beginning of their junior year or later. Interested students should consult their advisors as early as possible, preferably during their sophomore or junior years, to plan their academic programs. Claremont Graduate University is authorized to recommend candidates to the California Commission on Teacher Credentialing for public school teaching multiple or single-subject clear credentials with cross-cultural, language, and academic development (CLAD) emphasis in most recognized

teaching areas. Interested students should contact the director of teacher education at the graduate university for specific information early in their undergraduate careers.

Scripps College was founded in 1926 by newspaper publisher, educator and philanthropist Ellen Browning Scripps as one of the few institutions in the West dedicated to educating women for professional careers, as well as personal intellectual growth. With an enrollment of approximately 980, Scripps administers a four-year liberal arts curriculum that emphasizes interdisciplinary studies in the humanities. Combined with rigorous training in the disciplines, studies provide the foundation for careers in the professions, the arts, business, science, government, and the academia, as well as for fulfilling private lives.

Claremont McKenna College (CMC), founded in 1946, is a coeducational residential liberal arts college with an enrollment of about 1,200. The college educates students for responsible leadership in business, government and the professions within the context of a liberal arts curriculum that emphasizes economics and government. With 11 on-campus research institutes, CMC provides faculty and students the opportunity to study issues ranging from leadership to international relations to environmental management.

Pitzer College, founded in 1963, is a coeducational, undergraduate, liberal arts college that blends classroom instruction with fieldwork and engages a student's mind, heart and spirit by integrating educational resources on campus, abroad and in the local community. Pitzer enrolls approximately 1,000 students in more than 40 fields of study leading to the bachelor of arts degree. Its curriculum focuses on interdisciplinary, intercultural education with an emphasis on social responsibility and community service.

Keck Graduate Institute of Applied Life Sciences (KGI), established in 1997, provides a professional degree program for scientists and engineers and recent college graduates with science and engineering degrees wishing to pursue business leadership roles in the bioscience industry. This two-year program includes rigorous interdisciplinary coursework, a capstone team project and an industrial internship. The curriculum interweaves the study of systems biology, computer science and bioengineering with instruction in organizational structure, finance, management and business ethics. Upon successful completion of the program, KGI confers the master of bioscience degree. KGI is an independent, coeducational institution of approximately 130 students and was the first American graduate school dedicated exclusively to the applied life sciences.

RESOURCES OF THE CLAREMONT COLLEGES

As one of The Claremont Colleges, Harvey Mudd College shares the use of many facilities and services.

The Claremont Colleges Library provides vast resources that include well over two million volumes. The Library partners with The Claremont Colleges in learning, teaching and research. Committed to fostering intellectual discovery, critical thinking and life-long learning, the Library ties the academic community to varied cultural and scholarly traditions by offering user-centered services, building collections, developing innovative technologies and providing an inviting environment for study, collaboration and reflection.

Honnold/Mudd Library holds collections in the humanities, sciences and social sciences. Honnold/Mudd has been a selective depository for United States Government publications since 1913. Its holdings include publications issued by the State of California, the United Nations, other international agencies and Great Britain. Also in Honnold/Mudd, the Asian Studies Collection includes more than 80,000 items, most in Chinese, Japanese and Korean languages. The CUC Records Center, located at 2038 W. 11th Street in Upland, houses paper journals and a small percentage of books from the library collections. Materials at the Records Center may be requested for delivery or may be browsed on site.

Librarians and staff provide assistance with locating and using both traditional and

electronic information sources. Librarians teach students how to find, evaluate and effectively use information and offer research assistance via email and instant messaging. Research instruction for classes and other groups, as well as individual appointments for instruction and research assistance, may be scheduled.

The Library's large collection of electronic resources provides ready access to a wide variety of bibliographic, full-text and multimedia information. Via the Internet, it is possible to search Blais, the online catalog, or any of hundreds of databases including services such as Lexis-Nexis Academic and ISI Web of Science. Full-text resources include electronic books and journals, as well as specialized resources such as the ACM Digital Library, Congressional Quarterly Library and Grove's Dictionary of Art Online. The Claremont Colleges Digital Library (CCDL) provides access to a growing number of digital collections from the colleges as well as from the library's Special Collections. Digital collections such as Early English Books Online and North American Women's Letters & Diaries make available thousands of additional primary source materials. Most of these resources are accessible via the Internet to students, faculty and staff of The Claremont Colleges.

The Library has many special collections. Some of the most distinctive are the Oxford Collection, the Bodman Collection (history and literature of the Italian Renaissance), the Philbrick Library (drama and theater history), the Westergaard and Bjork Collections (Scandinavia and the Baltic area), and the McCutchan Collection (American hymnology). Students in history may do research in the Macpherson Collection (by and about women), the William Smith Mason Collection (Western Americana), the Wagner Collection of History and Cartography of the North Pacific, the William McPherson Collection of Western Americana, and the Hanna Collection (Western Americana). Local history collections include materials on water resources in Southern California and The Claremont Colleges Archives. For students in the sciences, the Hoover Collection contains rare volumes on the history of science and the metallic arts assembled by President Herbert Hoover and his wife, Lou Henry, and the Woodford Collection includes rare and historical geology books.

Students also have access to several nearby affiliated libraries, including Denison Library on the Scripps College campus; the George C. Stone Center for Children's Books, a division of Claremont Graduate University's Center for Developmental Studies in Education; the botanical and horticultural library of the Rancho Santa Ana Botanic Garden; and the library at the Claremont School of Theology.

In addition, The Claremont Colleges support:

Tranquada Student Services Center, headquarters for the student health services of the Colleges. The building also includes Health Education Outreach, the Student Disability Resource Center, and the Monsour Counseling and Psychological Services, with a staff of full-time psychologists trained to facilitate the development of human skills and competencies.

The Robert J. Bernard Biological Field Station contains parcels in various stages of ecological succession and serves as a natural outdoor laboratory for many disciplines.

McAlister Center for Religious Activities, a nonsectarian meeting place for students and faculty as well as a place of worship.

Huntley Bookstore is the source for all course-required textbooks and support materials used at The Claremont Colleges. The bookstore carries many academic trade and reference titles, new releases, bestsellers, academic study aids, school and office supplies, emblematic clothing and gift items as well as magazines, snacks and soft drinks. Huntley Computer Sales provides both Apple and PC hardware and software at academic pricing as well as a selection of computer supplies, peripherals and repair services.

Table Mountain Observatory, is located one hour from campus, at an altitude of 7,200 feet, and is owned by Pomona College. The site is on the opposite side of the San Gabriel Mountains from Claremont, shielded from the lights of Los Angeles. At the site, The

Claremont Colleges jointly operate a 1.0-meter Cassegrain telescope, the largest undergraduate telescope in the country, which is available for use by qualified Harvey Mudd College students. The equipment available to students for classes and astronomical research includes two optical CCD imaging cameras, a near-infrared array camera, and a stellar spectrograph, all of which are interfaced to modern computers. Data analysis is done on campus in the Astronomical Imaging Laboratory.

Other educational resources of the colleges include the Intercollegiate Feminist Center for Teaching, Research and Engagement, the Intercollegiate Departments of Africana, Asian American and Chicana/o-Latina/o Studies, the Offices of Black and Chicano/Latino Student Affairs, Claremont Lincoln University (Claremont School of Theology), the Rancho Santa Ana Botanic Garden, the Blaisdell Institute for Advanced Study in World Cultures and Religion, the Institute for Antiquity and Christianity, the Rick and Susan Sontag Center for Collaborative Creativity and the California Institute of Public Affairs.

HARVEY S. MUDD, 1888–1955

A mining engineer, Harvey S. Mudd (1888–1955) was a graduate of Stanford and Columbia universities. He served with distinction as president of the American Institute of Mining and Metallurgical Engineers. With his father, he founded and later became president of Cyprus Mines Corp., whose Los Angeles-based international enterprises started with the development of the copper mines on the island of Cyprus.

Harvey Mudd was a director of the Southern Pacific Company, of the Texas Gulf Sulphur Company, and of the Founders Fire and Marine Insurance Company. He was a founding director of the RAND Corporation. He was a trustee of the California Institute of Technology, a director of the Hospital of the Good Samaritan, and a trustee of the Southwest Museum. He was president of the Southern California Symphony Association for 12 years and chairman of its board for nine years.

He had a particular interest in The Claremont Colleges and served as chairman of the Board of Fellows of Claremont College—now the Claremont Graduate University and the Claremont University Consortium—for a quarter of a century. While serving in that position, he helped plan for the undergraduate liberal arts college of engineering, science and mathematics that was chartered in 1955, shortly after his death.

STUDENT LIFE

HONOR CODE

The Honor Code, established and operated by the students, sets the fundamental principles of conduct for members of the College. It applies to all academic matters such as examinations, written material and laboratory reports—both at Harvey Mudd College and at the other Claremont Colleges. The Honor Code also governs activities outside of the classroom, including the safety of individuals, and private and college property.

Students are expected to act as responsible individuals, to conduct themselves with honesty and integrity both personally and academically, and to respect the rights of others. The College considers these standards to be essential to its academic mission and its community life.

In this context, the College is an inclusive community of faculty, students and staff. Those who make up the community have participated in developing the standards and the policies that they believe will support the primary purpose of the educational community and the personal development of the individual students.

Behavior that violates the honor code is referred to the student Judiciary Board or the Disciplinary Board for action. These authorities may impose penalties of varying degrees of severity, including expulsion from the College. Students should be aware of federal regulations that require all colleges to implement programs to prevent illicit drug and alcohol use and alcohol abuse by students and employees. It is the policy of the College to abide by these regulations. Violations may incur legal and College sanctions.

Under the Honor Code, students are expected to know and abide by all College policies, regulations and procedures, and to report any violations of these.

NEW STUDENT ORIENTATION

Orientation, which begins prior to the opening of classes each fall, includes transition-to-college-life programming, social events, placement examinations and academic orientation. All new students are expected to attend.

SCHEDULE

Since most courses meet three times a week and the normal academic program is five courses, most students spend three to five hours in class each day except Saturday and Sunday. In addition, most laboratory periods are scheduled in the afternoons. Most students do approximately three hours of academic work outside of class for every hour they spend in class (not including laboratories). Students should consult with their academic advisors to devise a realistic schedule that provides adequate time for study, extracurricular and social activity.

HOUSING FACILITIES

There are nine residence halls. All first-year students are required to live on campus. Single rooms, doubles and suites for three or more are available. Lounges in each building afford additional space for meetings and social activities.

DINING FACILITIES

Students may eat at Harvey Mudd's Hoch-Shanahan Dining Commons or at any of the other dining halls of the undergraduate Claremont Colleges. In addition to standard cafeteria meals, each meal plan provides a weekly allocation of "Board Plus" dollars for food purchases at campus retail sites.

SOCIAL LIFE

The social life of a student at Harvey Mudd College may be as active as the student wants. The Claremont Colleges' Calendar includes at least one concert every month, outside speakers almost daily, a dozen art exhibits a year, frequent theater presentations, two distinct athletic programs (CMC-HMC-Scripps and Pomona-Pitzer), cinema series, intramurals and many other events. Student-led committees sponsor a myriad of activities for the student body, including trips to Los Angeles for sporting and theater events, movies, amusement parks and museums; beach trips; camping and hiking trips; campus parties; dances; and more.

DIVISION OF STUDENT AFFAIRS

The Division of Student Affairs assists students in all aspects of their college lives. The office shares a suite with the associate dean for academic affairs to holistically anticipate and respond to students' academic and personal concerns. The campus life program, led by the dean of students, operates cooperatively with residence hall presidents to ensure a safe and supportive campus environment. These and many other services, including housing assignments, disability accommodations and a network of student staff in dorms, are designed to support students as they develop personally and academically.

STUDENT COUNSELING

All members of the student affairs staff, the associate dean for academic affairs, and members of the faculty and staff are readily available to help individual students with academic, career and personal questions. The associate dean for student health and wellness provides crisis intervention and brief counseling for students needing support while enrolled. The associate dean works closely with The Claremont Colleges' Monsour Counseling and Psychological Services that provide, without charge, the services of full-time psychologists. The service offers personal counseling, and all matters are confidential. Members of the staff also lead personal growth groups on topics such as psychological fitness, human sexuality, and relaxation and stress management.

STUDENT HEALTH

The Claremont Colleges maintain a health service for students while college is in session. A physician and a staff of registered nurses and nurse practitioners provide office care at the Student Health Service Monday through Friday, from 8 a.m. to 5 p.m. with extended hours on Wednesdays. Charges are made for medicines, laboratory tests, special supplies and some elective treatment. Referrals for treatment by specialists in all fields can be arranged when needed. Outside consultation, hospitalization and surgery are arranged by the health service, but are not financed by the College and payment for them is a responsibility of the individual student. Health care service is available throughout the academic year with the exception of scheduled vacations. As part of its continuing wellness programs, the Health Service seeks to empower students to take responsibility for their own health and well-being.

WRITING CENTER

The Harvey Mudd College Writing Center offers an arena where students can work through the writing process and improve the clarity and expression of their ideas by participating in individual conferences with trained peer consultants. Student writers of all skill levels writing in any discipline can work with consultants, who offer feedback and encouragement during any stage of the writing process, from developing an idea to polishing a final draft. Peer consultants are also trained to help students with graduate school and fellowship essays, as well as presentations and public speaking projects. The Writing Center is open

five evenings a week and Saturday afternoons throughout the academic year. In addition to individual conferences and occasional topical group workshops, the center offers a variety of print and electronic resources for writers.

ACADEMIC EXCELLENCE

The Academic Excellence Program provides opportunities for students to work together to improve their understanding of concepts and problems in most technical Core courses. Workshops are guided by student facilitators who are outstanding upper-class majors recommended by their departments. Facilitators are trained to teach problem solving and collaborative learning strategies while helping students work to understand the material at the level of mastery required for success at Harvey Mudd.

OFFICE OF THE REGISTRAR

The Office of the Registrar maintains official academic schedules and records of students, present and past. The office also manages classroom scheduling, course enrollment, major declaration and changes, advisor assignments, degree audits, grades, Dean's List and other honors and distinctions, veteran's benefits, enrollment verifications, transcript requests, and degree verifications.

CAREER SERVICES

The Office of Career Services provides resources to assist students in making informed career decisions. Throughout the academic year, workshops are conducted on resume writing, interviewing, networking, negotiating and researching. On-campus recruiting occurs during Career Fairs that typically attract more than 60 companies to campus. Various events are held during the academic year and are advertised to students on the Web and via email. The Career Resource Library includes periodicals, how-to books, directories and industry-specific books; a database of companies provides additional resources for students. Individual career counseling is also available.

OFFICE OF INSTITUTIONAL DIVERSITY

The Office of Institutional Diversity (OID) serves as the hub of diversity training, information, consulting and programming for the Harvey Mudd community, as well as partners with a wide variety of Harvey Mudd departments and 5-C offices to design, implement and evaluate diversity activities. OID also provides direction and advice to its partners to ensure that diversity goals are obtained. The office coordinates a wide range of diversity programs and educational activities for Harvey Mudd students, staff and faculty. These programs include:

- Asian Heritage Month
- Black History Month
- OID Book Club
- GAYpril Events
- OID Movie Series
- Women's History Month
- Cinco de Mayo

OID maintains a comprehensive library of diversity resources (movies, videos, documentaries, books, magazines) which is available to the entire Harvey Mudd community, provides on-going mentoring and counseling to underrepresented students at Harvey Mudd, and serves as a supplementary advisor to the following student organizations:

- Asian-Pacific Islander-Support Program at Mudd (API-SPAM)
- People Respecting Individuals' Sexualities at Mudd (PRISM)
- National Society of Black Engineers (NSBE)

- Society of Women Engineers (SWE)
- Society of Professional Latinos in STEMS (SPLS)

The office also hosts the Summer Institute, an intensive, four-week summer residential experience that offers new students an early introduction to Harvey Mudd.

ROTC

Students interested in pursuing a commission in the United States Air Force or United States Army concurrently with obtaining a degree may do so by enrolling in Reserve Officer Training Corps (ROTC). Harvey Mudd College students may enroll in Air Force ROTC (housed at the University of Southern California) or Army ROTC (housed at Claremont McKenna College).

ATHLETICS AND RECREATION

Harvey Mudd College, Claremont McKenna College and Scripps College are associated in a joint program of intercollegiate athletics, intramural and recreational activities, physical education and club sports known as Claremont-Mudd-Scripps (CMS). CMS facilities include a football field, gymnasium (an aerobic fitness room, a weight room with both free weights and a Nautilus system), a soccer field, a lacrosse field, a nine-lane 400-meter track, a baseball field, a softball field, an aquatics center with a competition pool for swimming, diving and water polo, nine tennis courts, volleyball courts, and numerous intramural and recreational fields.

The intercollegiate athletic program is one of the most successful athletic programs in the country. A member of the NCAA Division III and the Southern California Intercollegiate Athletic Conference (SCIAC), which has eight members, CMS sponsors 21 intercollegiate sports for men (the "Stags") and women (the "Athenas").

Students who do not participate in intercollegiate competition may join intramural teams, such as inner-tube water polo, flag football, volleyball, soccer, basketball, softball, golf, swimming, paintball, tennis, ultimate Frisbee and floor hockey.

Club sports of ballroom dancing, fencing, men's lacrosse, men's and women's rugby, women's field hockey, ultimate Frisbee and rowing are additional pastimes.

An extensive list of offerings is available for physical education credit, which may be pursued even beyond the three-semester requirement.

Harvey Mudd's Linde Activities Center (LAC) is the hub of students' recreational and fitness activities. The LAC has aerobics and weight rooms, meeting rooms, a computing lab, and basketball, badminton and volleyball courts. It is open to all Harvey Mudd students and their guests.

STUDENT GOVERNMENT

The College encourages students to participate in the governing of student life through the Associated Students of Harvey Mudd College (ASHMC). Student body, class and dorm officers manage committees that plan and coordinate many extracurricular and social activities. ASHMC's Committee for Activities Planning plans and promotes off-campus activities for students, ranging from concerts to rock-climbing. All students are encouraged to participate and contribute ideas for upcoming events.

OTHER ACTIVITIES

Many other activities of interest to students may be found on the Student Activities web page, hmc.edu/student-life/student-activities/.

ADMISSION

APPLICANT INFORMATION

Harvey Mudd College enrolls approximately 200 new students each year. The College has become highly selective in the past several years as the number of applications has grown significantly. We seek to assemble a group of new students that is as diverse as possible that also represents the values of integrity, community, and of academic depth and breadth that are espoused in HMC's Mission Statement and in the Honor Code.

When reviewing each candidate, the committee considers carefully every aspect of the student's application. We seek to understand the student's accomplishments within the context of the opportunities available to the student. We look for potential as well as achievement, and we look for people who seem to match the values of the College. We are mindful of students who have shown personal and academic growth. We pay attention to extensive participation or leadership within one's school or community activities. We admire an unusual accomplishment in a scientific area, a special talent or a notable amount of resilience. The College actively seeks a diverse student population and encourages applications from candidates whose backgrounds have been underrepresented in engineering, science and mathematics.

When reviewing applications, the student's academic course load and the grades earned are the primary concern, but we also look carefully into the student's writing ability and the recommendations received in support of the applicant. The Admission Committee notes trends in grades, relative strengths and weaknesses, and overall academic preparation.

Most of the College's entrants have stood in the top 10 percent of their high school classes. The Admission Committee is especially impressed by students who have earned top grades in rigorous mathematics and science courses but who also excel in the humanities, social sciences and the arts.

Those who have an unusual academic background (alternative programs, home-schooling, graduating early, etc.) are given equal consideration. Such candidates should consult the Office of Admission counselors to learn how to present their experiences completely and clearly.

FIRST-YEAR ADMISSION

There are three application deadlines for admission to the first-year class. The Early Decision I deadline is November 15 with notification sent by December 15. The deadline for the second round of Early Decision (ED II) is January 5 with notifications sent by February 15. Regular Decision candidates apply by January 5, are notified by April 1, and must respond to the offer of admission by May 1. All acceptances are contingent upon satisfactory completion of the final term in good standing in all matters related to course work and character.

First-year students can apply for entrance only in the fall semester. If any questions arise about the application, the staff in the Office of Admission is available for advice and counsel to all students and their families.

Common Application– All candidates for admission should apply using the Common Application, which can be found at www.commonapp.org or by using links provided on the Harvey Mudd Admission website.

Application Fee– The admission application should be accompanied by a $70 application fee, which covers part of the cost of processing the application. It is not refundable. Students who have significant financial need should not be discouraged from applying but should file their admission applications and use the Common Application to request a fee waiver.

Counselor and Teacher Recommendations– These are confidential reports by the school counselor and by classroom teachers. The school report is completed by a high school counselor. An instructor of English, history or foreign languages should complete a second

recommendation. A third recommendation must be completed by a mathematics or science teacher.

Official Transcripts– Applicants must submit transcripts from their most recent high school term. A transcript showing work completed in the first term of the senior year should be sent as soon as those marks are available. Students must also file transcripts for any college courses completed. A final official transcript confirming graduation and good standing at the conclusion of the school year is also required of any enrolling student.

Standardized Tests– Every first-year applicant is required to take the SAT or the ACT exam (including the writing component). All applicants are also required to take two SAT Subject Tests: Math Level 2 and a second exam of the candidate's choice. Early Decision I applicants may take the SAT or ACT Reasoning Test and/or Subject Tests as late as the November test date. Applicants for ED II may submit scores from tests taken as late as December. Regular Decision applicants may take the SAT tests as late as the January test date or the ACT exam as late as the December test date. The Admission Committee will only accept and review official score reports submitted by the College Board or ACT Inc. *Our policy requires students to send all SAT and/or ACT scores.*

Personal Interview– Interviews are not required but are strongly recommended. They provide an excellent opportunity for applicants to learn more about Harvey Mudd College. They also allow a member of the admission committee to know an applicant better. Typically, interviews occur during the fall of, or in the summer just before, a student's senior year. Preferably, the interview will occur before the application deadline passes.

CURRICULAR EXPECTATIONS

Applicants are expected to complete a strong program of studies throughout their secondary school career. Each enrolling student is required to complete one year of high school or one semester of college course work in calculus, chemistry and physics. Students who are unable to complete one or some of these courses may be admitted contingent upon successful completion of a summer college course in that discipline. Applicants who will not have completed the requirements should make this fact known at the time of their applications.

The Admission Committee encourages students to pursue work in advanced courses, especially in science and mathematics, if their preparation allows.

English – Four years. It is assumed that the student will have a thorough grounding in grammar and competence in writing and speaking.

Mathematics – Calculus is required before entering in the fall.

Laboratory Science – At least one year of chemistry and one year of physics are required before entering in the fall. One year of biology is recommended.

Foreign Language – Two years recommended.

Social Science – Applicants are encouraged to elect at least two years of social science courses, including at least one year of history.

FIRST-YEAR EARLY DECISION

First-time college candidates who decide that Harvey Mudd College is clearly their first choice may use one of the Early Decision options. Applicants admitted through Early Decision are expected to withdraw all other college applications, to not initiate new ones and to enroll at Harvey Mudd College. Students, a parent or guardian, and the student's counselor all sign a statement verifying that all other college applications will be withdrawn. Students who apply under an Early Decision plan may only have one Early Decision application currently active at any one time. This means that a student may only use the Early Decision option at Harvey Mudd College if Early Decision applications to other colleges have been closed.

Students who are unsure about their choice for college should not use an Early Decision option but should instead apply by the Regular Decision deadline of January 5. Early Decision candidates should submit all of their credentials by November 15 for Early Decision I or by January 5 for Early Decision II.

In considering Early Decision applicants, the Admission Committee may vote in one of three ways: it may accept the candidate, it may postpone the application to be reviewed again with the Regular Decision pool, or it may deny admission. An early application is denied if the committee feels that the application would be rejected within the Regular Decision pool context. If a decision is postponed, an applicant's chances for acceptance are not prejudiced in any way, and the application is considered along with all Regular Decision candidates. Students whose decisions are postponed are released from the agreement (obligation to enroll) that was signed in the Early Decision Statement.

Early Decision I candidates who wish to apply for financial aid must file their online College Scholarship Service (CSS)/Financial Aid PROFILE application on or before November 15. The deadline for Early Decision II applicants is January 5. Candidates must also submit a signed copy of their parents' federal income tax return from the previous year. For information about applying for financial aid go to https://www.hmc.edu/admission/afford/.

DEFERRED ENTRANCE

Candidates who are accepted for admission may request to defer their entrance for a year. They should write to the Office of Admission describing their plans and must submit their commitment deposits by May 1. A student who plans to defer enrollment at HMC may not enroll in a degree program at another college during this interval, and they may not initiate any new applications.

INTERNATIONAL STUDENTS

International students are those who are not a U.S. citizen or a permanent resident of the U.S. The procedure for the admission of international students is essentially the same as the procedure for domestic students. International applicants must submit all official credentials in English or with translations. In addition, international students must show that they are sufficiently fluent in English to enable them to handle the work of all courses. Harvey Mudd College does not offer English as a Second Language or other special programs for non-English speaking foreign students.

Scores from the TOEFL (Test of English as a Foreign Language) or the International English Language Testing System (IELTS) are required of international candidates. The minimum score required for the TOEFL examination is 100 (on the Internet-based test, 600 on the paper version). The minimum score for IELTS is 8. The requirement for the TOEFL or IELTS can be waived based on a request made by the applicant. Harvey Mudd College offers funding for a small number of international students.

FINAL TRANSCRIPTS REQUIRED

Enrolling first-year students must submit a final high school transcript that should indicate the day, month and year of graduation. Enrolling first-year or transfer students must also submit any and all college transcripts showing the most recent marks obtained. If the enrolling student does not have a high school diploma or a GED equivalent (or, for California residents, the CHSPE), the student must be able to demonstrate strong academic performance that assures the Admission Committee that the student has excelled in an academic program with depth and rigor. College-level courses taken while a high school student are not eligible for transfer to Harvey Mudd.

A final transcript is a critical component in allowing the College to award federal financial assistance. To be eligible for Title IV funds (federal student aid programs), a student must

submit evidence of a high school diploma, an equivalent such as a GED, or must complete secondary school in a homeschool setting (as defined by state law). High school diplomas from other countries are acceptable toward the student's eligibility as long as the diploma is equivalent to a U.S. high school diploma.

ENROLLMENT DEPOSIT

Every admitted student who plans to enter is required to remit a non-refundable enrollment deposit of $300 to the Office of Admission by the date prescribed in the acceptance letter. Confirmation of final admission is contingent upon this deposit.

TRANSFER ADMISSION

The College only accepts transfers for the fall term. Students are considered for transfer standing if they will have completed the equivalent of one year of full-time academic coursework by the time they enter Harvey Mudd College. Candidates must submit their applications by April 1 prior to the September of desired enrollment. Notification is sent by May 15 and response regarding the offer of admission is required by June 1.

In addition to the application, personal essays and the application fee, transfer candidates must submit a final transcript from secondary school and transcripts of all previous college work. We also require course descriptions of all college courses completed or in progress. Three recommendations are required. At least one of the three required references must come from a mathematics, science or engineering instructor at the candidate's college. A second recommendation must be submitted by an instructor from humanities, social sciences or the arts. A statement from a college official (advisor, dean of students, or the like) is also required in which the official verifies that the candidate is in good standing. Transfer candidates are encouraged to submit two SAT Subject Tests (Math Level 2 and another of the student's choice).

In assessing transfer applications, the Admission Committee places considerable weight on the nature and quality of the previous college record. An important factor in selecting transfer students concerns the kinds of courses the applicant has completed. The College seeks transfer candidates who have completed courses similar to those in its Core Curriculum. Where college transcripts do not clearly indicate the quality of work (e.g., many pass/no credit courses), it is the applicant's responsibility to provide supplemental information to assist the committee's evaluation.

All transfer students must spend the equivalent of four full-time semesters at Harvey Mudd and must complete all Harvey Mudd degree requirements.

The College policy on awarding credit for work completed elsewhere is described under "Academic Regulations." Offers of admission are conditional, pending review of final transcripts showing satisfactory completion of courses in progress.

3-2 PROGRAMS

Harvey Mudd offers a 3-2 Program in Economics and Engineering in cooperation with Claremont McKenna College. The program is designed for students who want a liberal arts background, with emphasis on economics and management, and an engineering major. The students spend their first three years at Claremont McKenna College studying mathematics, science, economics, management and general education courses, as well as completing courses equivalent to HMC's Common Core. At the end of the junior year, they may apply as transfer students to Harvey Mudd.

Harvey Mudd also has a 3-2 program in Engineering with Scripps College. It is similar to the 3-2 program with Claremont McKenna College, but the 3-2 Program with Scripps College does not include the emphasis on economics. The students reside at Scripps College for their first three years and cover a broad range of courses with emphasis in mathematics and science.

Students accepted into either 3-2 program must complete Harvey Mudd's requirements for general education and for the engineering major. Because curricular expectations for the 3-2 transfer program are specific, potential applicants are strongly encouraged to consult with the Harvey Mudd College Office of Admission, the Harvey Mudd College Office of the Registrar, and the chair of the Department of Engineering.

VETERANS AND THEIR DEPENDENTS

To receive veteran education benefits, a veteran or a veteran's dependent must apply to the Veterans Administration to receive a Certificate of Eligibility. (A Certificate of Eligibility does not constitute admission to the College.) Students must notify the Office of the Registrar and the Office of Student Accounts if they expect to receive veteran's benefits. Upon enrollment at Harvey Mudd, the veteran (or dependent) should present the Certificate of Eligibility to the Office of the Registrar. The Office of the Registrar will file the necessary documentation with the Veterans Administration to certify the student's enrollment at Harvey Mudd. Please be aware that the College is obligated to notify the Veterans Administration of any change to the student's certification status, such as a student's withdrawal from a course or a student's failure to maintain satisfactory academic progress toward the degree. Additional general information about various educational benefit programs for veterans and their dependents can be found at gibill.va.gov.

ADVANCED PLACEMENT

The Admission Committee recognizes that advanced placement (AP), International Baccalaureate (IB) and honors courses are often more demanding than conventional courses and gives appropriate weight to them in the selection process. Harvey Mudd does not award credit for either AP or IB exams.

COURSES FOR HIGH SCHOOL STUDENTS

Local high school students may be permitted to take one course at HMC per term. The courses are typically taken in mathematics and science and are usually not offered in their high schools. These students must have excellent academic credentials and submit a "special student application" no later than two weeks prior to the start of classes. Selection is made by the Office of Admission after reviewing the application and following consultation with the appropriate academic department(s). These students are not considered to be in residence. Charges for special course work are nominal, reflecting only the administrative processing costs, not the cost of instruction. The Office of Admission can provide details on fees for the coming year.

CAMPUS VISITS

Students and their parents are encouraged to visit Harvey Mudd College, especially when classes are in session. Tours, class visits, interviews and overnight stays are available. Please contact the Office of Admission at 909.621.8011 or visit the Harvey Mudd website to arrange a visit and get directions.

COLLEGE EXPENSES

TOTAL EXPENSES

Listed below are the total College expenses for the 2015–2016 academic year:

Tuition	$ 50,368
Room Rent	$ 8,855
Board (16 meals)	$ 7,651
Student Body Fee	$ 281
Total	**$ 67,155**

The transportation allowance will vary based on distance, ranging from $200 to $1,400. Students will be automatically enrolled in the Student Health Insurance Plan unless proof of comparable coverage is provided and a waiver is submitted by the deadline date. The College reserves the right to change these, or any other fees, at any time. Entering first year and transfer students will be charged an additional $250 Orientation fee. It is projected that overall expenses will increase about 5 percent each academic year. However, the College has been very successful in assisting students who need financial aid through its extensive program of scholarships and grants, education loans and student employment.

TUITION

The tuition charge for the 2015–2016 academic year at Harvey Mudd College is $50,368. Students enrolled in 10 or more credits are charged full tuition. Those in less than 10 are charged pro rata.

ROOM AND BOARD

The 2015–2016 charge for a campus room is $8,855. Board charges for the year are $7,651 for 16 meals a week plus $16 "Board Plus" per week (full board). Other board plans are available.

DUES AND FEES

Dues set by the Associated Students of Harvey Mudd College are $281 per year.

OTHER EXPENSES

Additional expenses for a year at Harvey Mudd College also include the cost of books and supplies, clothing, transportation, recreation and incidentals. An allowance toward transportation expenses should be added for students outside the Southern California region only.

MONTHLY PAYMENT PLAN

Payment of all regular charges is due prior to the beginning of each semester per the due date on the Harvey Mudd College billing statement (full payment plan). However, annual charges may be paid in 10 monthly installments. The first installment is due in July, and the final installment is due the following April. Applications for the monthly payment plan are mailed to all students in June, and there is a service charge of $10 per month ($50 per semester). Use of the monthly payment plan is a privilege that may be revoked for just cause.

FINANCIAL AID

Harvey Mudd College offers a comprehensive program of scholarships, grants, loans and work from the College, the federal and state governments and from other sources to assist students and parents in paying the cost of attending Harvey Mudd College.

The College is committed to its need-blind admission policy for domestic students and guarantees that it will meet 100 percent of the demonstrated financial need of each applicant as determined by the Free Application for Federal Student Aid (FAFSA) and the CSS/ Financial Aid PROFILE applications.

Approximately 77 percent of the families with students attending Harvey Mudd College receive need-based or non-need based financial assistance in the form of scholarships, grants, work-study and/or loan funds. Approximately 70 percent receive scholarship assistance directly from Harvey Mudd College.

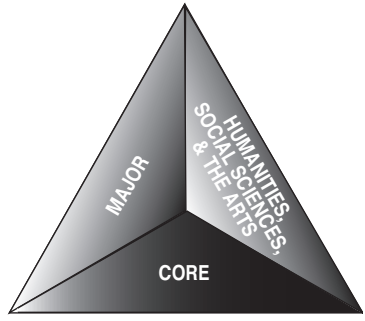
One of the primary goals of the financial aid staff is to inform prospective students and parents, as well as current students and parents, of the various financial aid programs available to assist families with educational costs. For information, consult "Admission & Financial Aid" on the Harvey Mudd website (www.hmc.edu) or contact the financial aid staff with questions at 909.621.8055.


RONALD & MAXINE
ACTIVITIE
Mr. Sparkle
The GREAT
GATSBY
CaSoCmas

ACADEMIC PROGRAM

OVERVIEW

The founders of Harvey Mudd College envisioned a distinctive educational experience for the College's students. The curriculum was designed to create scientists and engineers with unusual breadth in their technical education and a firm academic grounding in the humanities, social sciences and the arts.



The required curriculum, as revised by the College in January 2010, is divided into three components: the Common Core, which provides the foundation for advanced study; the program in Humanities, Social Sciences, and the Arts, which completes the liberal arts nature of a Harvey Mudd College education by providing humanistic and social scientific perspectives; and the major, which builds depth and technical competence. Unifying all of these is an emphasis on strong oral and written communications, the development of computational skills and direct experience with a research or design project. The academic programs are demanding, but the College fosters cooperation rather than competition under a successful Honor Code.

In order to be recommended by the faculty for the bachelor of science degree, students are required to complete satisfactorily a minimum of 128 credit hours of courses (including approved transfer credits for courses taken at other colleges). Students must complete all of the requirements of each of the three curricular components as well as a physical education requirement.

COMMON CORE

The Common Core presents a coordinated, common foundation essential to the education of all students. It includes three semesters of mathematics, two and one-half semesters of physics and an associated laboratory, one and one-half semesters of chemistry and an associated laboratory, an interdisciplinary or disciplinary "Core lab" selected from a changing set of offerings, a half-semester of college writing, a course in critical inquiry offered by the Department of Humanities, Social Sciences, and the Arts, and one course each in biology, computer science and engineering.

Core courses address three objectives: (1) acquisition of disciplinary knowledge and experience with disciplinary-related techniques, (2) skill development in the areas of oral and written communication, critical thinking, teamwork and collaboration, project management and/or leadership, and (3) explorations of either the interrelationship of technical work and society or the understanding of one's own culture or other contemporary cultures.

All Core courses must be attempted by the end of the fifth semester.

Students have the option of graduating under the curriculum spelled out in any catalogue (that is, fulfilling the set of Core, major, HSA and overall unit requirements represented by any catalogue) that is in effect during their continuous enrollment at the College. Students who entered the College in the fall of 2013, for example, would be able to graduate under the 2014–2015 catalogue, if they formally notify the registrar of their wish to do so. However, the student selecting a later catalogue is bound by that catalogue's entire curriculum and may not cherry-pick components of the curriculum.

Students will find courses that have prerequisites, corequisites or concurrent requisite in their description. Following are the definitions:

A prerequisite is a course (or in rare cases, a requirement) that must be completed before a student can register for the course in question.

A concurrent requisite is a course that a student must register for at the same time as the course in question. (For example, a lab which must be taken at the same time as the lecture.)

A corequisite is a course that a student must either have completed prior to OR be registered concurrently with the course in question.

Core courses are listed below. Course descriptions are also given in the course listings for the departments. Core lab (CL057) section descriptions are provided annually to first-year students in advance of pre-registration for sophomore courses.

WRITING (WRIT)

1. INTRODUCTION TO ACADEMIC WRITING (1.5 credit hours)
A seminar devoted to effective writing strategies and conventions that apply across academic disciplines. The course emphasizes clarity, concision, and coherence in sentences, paragraphs, and arguments.

CORE LABORATORY (CL)

57. CORE LAB (1)
Laboratory course emphasizing experiential learning. Section topics will vary yearly and will be publicized to first-year students before they register for sophomore courses.

BIOLOGY (BIOL)

52. INTRODUCTION TO BIOLOGY (3)
Topics in molecular biology, genetics and evolution. Prerequisites: Computer Science 5 or equivalent, one semester of general chemistry and one semester of calculus.

CHEMISTRY (CHEM)

23A. FIRST-YEAR CHEMISTRY I (3)
Chemistry plays a powerful role in addressing an array of current and future global and societal challenges. This course examines contemporary applications of chemistry to describe innovative advances in such areas as energy, medicine, technology, materials, to name a few. These applications illustrate such fundamental concepts as molecular and electronic structure in dictating chemical and physical properties; intermolecular forces, phase behavior, thermodynamics, electrochemistry, kinetics and equilibria. Lecture and individual and group exercises conducted in class are used as a context for introducing chemistry principles.

23B. FIRST-YEAR CHEMISTRY II (1.5)
See description above, **FIRST-YEAR CHEMISTRY I.**

24. CHEMISTRY LABORATORY (1)
Applications of thermodynamics, equilibria, electrochemistry, structure/property relationships, synthesis, spectroscopy, and chemistry in the service of society.

COMPUTER SCIENCE (CSCI)

5. INTRODUCTION TO COMPUTER SCIENCE (3)
Introduction to elements of computer science. Students learn general computational problem-solving techniques and gain experience with the design, implementation, testing and documentation of programs in a high-level language. In addition, students learn to design digital devices, understand how computers work, and learn to program a computer in its own machine language. Finally, students are exposed to ideas in computability theory. The course includes discussions of societal and ethical issues related to computer science.

ENGINEERING (ENGR)

59. INTRODUCTION TO ENGINEERING SYSTEMS (3)
An introduction to the concepts of modern engineering emphasizing modeling, analysis, synthesis and design. Applications to chemical, mechanical and electrical systems. Prerequisite: sophomore standing. Corequisite: Physics 51.

HUMANITIES, SOCIAL SCIENCES, AND THE ARTS (HSA)

10. CRITICAL INQUIRY (3)
This course introduces students to inquiry, writing, and research in HSA, through focused exploration of a particular topic selected by the instructor in each section. To encourage reflection on the place of HSA within the Harvey Mudd curriculum, the course begins with a brief unit on the history and aims of liberal arts education. Prerequisite: Writing 1; Writing 1E may serve as a co-requisite in lieu of the prerequisite.

MATHEMATICS (MATH)

30B/G. CALCULUS (1.5)
A comprehensive view of the theory and techniques of differential and integral calculus of a single variable; infinite series, including Taylor series and convergence tests. Focus on mathematical reasoning, rigor and proof, including continuity, limits, induction. Introduction to multivariable calculus, including partial derivatives, double and triple integrals. Placement into Math 30B is by exam and assumes a more thorough background than Math 30G (Prerequisites for 30B: Mastery of single-variable calculus—entry by department placement only. Prerequisites for 30G: One year of calculus at the high school level.); it allows for a deeper study of selected topics in calculus.

35. PROBABILITY AND STATISTICS (1.5)
Sample spaces, events, axioms for probabilities; conditional probabilities and Bayes' theorem; random variables and their distributions, discrete and continuous; expected values, means and variances; covariance and correlation; law of large numbers and central limit theorem; point and interval estimation; hypothesis testing; simple linear regression; applications to analyzing real data sets. Prerequisites: Mathematics 30B or Mathematics 30G.

40. INTRODUCTION TO LINEAR ALGEBRA (1.5)
Theory and applications of linearity, including: vectors, matrices, systems of linear equations, dot and cross products, determinants, linear transformations in Euclidean space, linear independence, bases, eigenvalues, eigenvectors, and diagonalization. Prerequisites: One year of calculus at the high school level.

45. INTRODUCTION TO DIFFERENTIAL EQUATIONS (1.5)
Modeling physical systems, first-order ordinary differential equations, existence, uniqueness, and long-term behavior of solutions; bifurcations; approximate solutions; second-order ordinary differential equations and their properties, applications; first-order systems of ordinary differential equations. Prerequisites: Mathematics 30B or Mathematics 30G.

60. MULTIVARIABLE CALCULUS (1.5)
Review of basic multivariable calculus; optimization and the second derivative test; higher order derivatives and Taylor approximations; line integrals; vector fields, curl, and divergence; Green's theorem, divergence theorem and Stokes' theorem, outline of proof and applications. Prerequisites: Mathematics 30B or Mathematics 30G; Mathematics 40.

65. DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA II (1.5)
General vector spaces and linear transformations; change of basis and similarity; generalized eigenvectors; Jordan canonical forms. Applications to linear systems of ordinary differential equations, matrix exponential; nonlinear systems of differential equations; equilibrium points and their stability. Prerequisites: Mathematics 40 and Mathematics 45; or permission of instructor.

PHYSICS (PHYS)

22. PHYSICS LABORATORY (1)
This course emphasizes the evidence-based approach to understanding the physical world; students design, conduct and interpret experiments to give quantitative answers to physical questions. Topics are drawn from a broad range of physics subjects, with applications to other technical fields.

23. SPECIAL RELATIVITY (1.5)
An introduction to special relativity covering kinematics, energy, momentum, conservation laws and applications to cosmology.

24. MECHANICS AND WAVE MOTION (3)
Kinematics, dynamics, linear and angular momentum, work and energy, harmonic motion, waves and sound.

51. ELECTROMAGNETIC THEORY AND OPTICS (3)
An introduction to electricity and magnetism leading to Maxwell's electromagnetic equations in differential and integral form. Selected topics in classical and quantum optics. Prerequisites: Physics 23-24; corequisite, Mathematics 60.

COMPLETING THE COMMON CORE

Core courses are offered once annually, with the exception of Core Lab 57, which is offered fall and spring. Most students complete the Common Core by the end of the sophomore year. First-year Core courses—Biology 52, Chemistry 23A, 23B, 24; Computer Science 5; HSA 10; Mathematics 30, 35, 40 and 45; Physics 22, 23, 24; and Writing 1—must be attempted in the first year and passed before the beginning of the junior year. Core Lab 57, Mathematics 60, 65 and Physics 51 must be attempted in the sophomore year. Engineering 59 must be attempted by the fifth semester. The Scholarly Standing Committee tracks student progress through the Core and notifies students of Core deficiencies (e.g., courses that are dropped, withdrawn, failed or not appropriately attempted). Students must register for all deficient Core courses each time they are offered. Sample programs for the first three semesters appear below.

Sample First-Year Program

	Fall Semester Credit Hours	Spring Semester Credit Hours
Biology 52		
Introduction to Biology		3
Chemistry 23A, 23B, 24		
Chemistry in the Modern World	3	
Chemistry in the Modern World		1.5
Chemistry Laboratory	1	
Computer Science 5		
Introduction to Computer Science	3	
Humanities, Social Sciences, and the Arts 10		
Critical Inquiry		3
Mathematics 30B/G, 35, 40, 45		
Calculus	1.5	
Probability and Statistics	1.5	
Linear Algebra		1.5
Introduction to Differential Equations		1.5
Physics 22, 23, 24		
Physics Lab		1
Special Relativity	1.5	
Mechanics and Wave Motion		3
Writing 1		
Introduction to Academic Writing	1.5	
Elective	3	3
Physical Education	1	
TOTAL CREDIT HOURS	**17**	**17.5**

The instructors in the first-year program meet regularly with the associate dean for academic affairs to ensure that course material, major assignments and examinations are coordinated throughout the year.

Sample Sophomore Fall Program

	Credit Hours
Engineering 59	
Introduction to Engineering Systems	3
Mathematics 60	
Multivariable Calculus	1.5
Mathematics 65	
Differential Equations and Linear Algebra II	1.5
Physics 51	
Electromagnetic Theory and Optics	3
Core Lab 57	
Topics vary by term and department	1
Elective	3
Humanities, Social Sciences, and the Arts course	3
Physical Education	1
TOTAL CREDIT HOURS	**17**

HUMANITIES, SOCIAL SCIENCES, AND THE ARTS

The program in Humanities, Social Sciences, and the Arts is one of the distinctive and defining aspects of Harvey Mudd College. From its inception, the College has regarded a strong grounding in these areas to be an essential part of the education of engineers, scientists and mathematicians, who need to be mindful of the richness and complexities of the human experience as well as the social contexts and consequences of their own endeavors.

In addition to the Common Core course (HSA 10), students must complete 10 full semester courses (or their equivalent) in a coherent program planned with the approval of their Humanities, Social Sciences, and the Arts advisor. This program must include two key elements:

- a concentration of courses in a single discipline or in an interdisciplinary field chosen from the distinct areas of liberal arts study offered at The Claremont Colleges
- a distribution of courses in different disciplines that exposes students to the varieties of intellectual approaches that inform the humanities and social sciences.

To foster the growth of an intellectual community, students must take at least five courses (beyond HSA 10) from departmental faculty members. This requirement is reduced for students who study abroad or for students whose concentrations are not regularly supported coursework at Harvey Mudd. Students may select their remaining courses from a large number available at Harvey Mudd College and the other Claremont Colleges. In addition to HSA 10, students must complete at least one HSA course that involves significant writing. Both departmental courses and HSA courses offered at the other Claremont Colleges (or outside of Claremont) can satisfy this requirement.

For more information regarding these requirements, see the listing under Departmental Programs in this catalogue, as well as the Department of Humanities, Social Sciences, and the Arts Advising Handbook.

PHYSICAL EDUCATION

The physical education requirement helps students develop skills for lifelong physical fitness. In the first year, students must register for a physical fitness course approved specifically for first year students; season-long participation in an approved team sport in the CMS (Claremont McKenna/Harvey Mudd/Scripps) joint athletic program may be used to satisfy the first-year physical education requirement. In addition to the first-year requirement, students must complete either an additional two physical fitness activity courses or an additional season-long participation in an approved CMS team sport. For further details, and for information about the relationship of intercollegiate and approved club sports to the physical education requirement, see Physical Education in the Departmental Programs section.

MAJORS (IN GENERAL)

A student must complete the requirements for one of the departmental majors, one of the interdisciplinary majors, an approved individual program of studies (IPS), or an off-campus major (OCM) and technical minor with approval from the associate dean for academic affairs. The departmental majors are: biology, chemistry, computer science, engineering, mathematics and physics. There are currently three interdisciplinary majors: joint chemistry and biology, joint computer science and mathematics, and mathematical and computational biology. Requirements for each major are listed in that major's section of this catalogue.

Every student should seek early guidance from faculty advisors in order to clarify the preparation required for specific majors. Students are expected to select a major or file a tentative IPS plan by the end of the fourth semester.

In the junior and senior years, students typically take two or three courses each semester in their major and related fields. Some of these are requirements while others are electives. All majors culminate in original research and design opportunities and include a capstone experience.

Students cannot be awarded a double major in a joint major and one of its component majors.

For students who wish to double-major, the majors' department chairs must approve the double counting of courses across their programs. The registrar must be notified of all such approvals.

STUDY ABROAD AND DOMESTIC EXCHANGES

Students at Harvey Mudd College have the opportunity to study away from the Harvey Mudd campus. Students may spend a semester or a year at a university abroad. This is most commonly done in the junior year. Students may also choose a summer abroad or short-term, faculty-led program.

Study Abroad

Selection Process

The Harvey Mudd College Study Abroad Program provides students the opportunity to develop an international perspective and broaden their education in ways not possible in Claremont. The selection process first begins with the Study Abroad Committee (SAC). This committee is composed of three faculty members and four college administrators with close ties to the study abroad process: the director of study abroad, the director of financial aid, the student accounts manager and the registrar. Selection for study abroad is based on a written application, and the SAC's review of each application is confidential.

Selection for study abroad is a two-step process. Applicants are reviewed by the SAC and, if approved, are referred to the respective study abroad programs. Each study abroad program provider has its own selection criteria, which may differ from the criteria used by Harvey Mudd. The number of applications program sponsors receive from other institutions may also affect the selection process, and a competitive situation can occur in programs with

a limited number of available spaces. In direct enrollment programs at foreign universities, students usually have to be accepted by a division of the university (often referred to as a Faculty or School) as well as the international office of the university. Because some programs have early application deadlines, notification from the program sponsor may occur prior to the final decision of the SAC, however, under normal circumstances, students are required to first apply to Harvey Mudd for approval. Students must have approval from both the SAC and the program sponsor.

Academic Background
Evidence of academic competence and preparation in the proposed area of study is required. Students must complete all necessary prerequisite courses before participating in the program. Students should note that many programs in foreign language environments require the completion of at least one college-level course at the designated level. This requirement may not be fulfilled through AP or SAT-II scores. For students interested in taking courses in the host country's language, strong language preparation is especially important. Students should be able to follow university lectures in the language in which they are given, participate in seminar discussions, take notes and understand written material in their field. Generally, four or five semesters of a foreign language at the college level is required.

Academic Appropriateness of Program
Applicants should present reasons for the appropriateness of the program in terms of academic, linguistic and/or cultural goals. This may be within the context of a liberal arts education or specific academic goals, normally focused on a student's major subject. In addition, the proposed program must be suitable in terms of academic content.

Suitability of Destination
The proposed destination should be suitable in terms of a student's stated goals for the semester abroad. The SAC will consider the academic resources of the proposed program, as well as if and why a proposed city, country or region presents a particularly advantageous environment in which to pursue one's stated goals.

GPA and Grades Requirement
A student's academic record is highly considered during the application review. Harvey Mudd requires a GPA of 2.5 or higher to apply for study abroad. The SAC cannot approve the application of a student who does not meet the Harvey Mudd and the overseas program's minimum GPA and/or foreign language requirement. Meeting a program's GPA requirement does not, however, guarantee acceptance.

Initiative, Maturity, Responsibility and Adaptability
The successful completion of a program abroad requires individual initiative and a sense of maturity and responsibility concerning social matters as well as academic duties. Students also must accept responsibility for representing the College well. Study abroad requires tolerance and a willingness to adjust to living and studying conditions very different from, and often much less comfortable than, those in Claremont. All of these qualities will be taken into account when the SAC judges the suitability of each candidate.

Normal Progress Toward Graduation
The proposed period abroad may not impede students' normal progress toward graduation. Students must indicate on their application how they plan to complete major and graduation requirements. Students' advisors must approve and sign the application.

Most Harvey Mudd students study abroad during their junior year. Although students may petition the Scholarly Standing Committee (SSC) to study abroad as early as the second semester of their sophomore year, many programs do not accept sophomores. If petitioning for sophomore study abroad, students must complete the Core before going abroad. Though challenging, students may also petition the SSC to study abroad during their senior year.

Ineligible Students
Students who are on academic or disciplinary probation or who have delinquent accounts are not eligible to apply for or to participate in study abroad programs. Students should be aware that the SAC may access their disciplinary record. Grades for the semester prior to departure will be reviewed before final approval is granted for participation in study abroad. Should grades fall below qualifying standards, approval for participation may be withdrawn.

Cost
Because the College wants all student study abroad decisions to be driven by academic, rather than financial, factors, students pay a comprehensive fee to Harvey Mudd that is equal to charges for tuition, room, full board and fees for the same period of time at Harvey Mudd. The fee covers the costs of the academic program, reasonable room and board in the host country and an allowance for round-trip transportation to the program site.

Academic Planning
Students must take a minimum course load equivalent to Harvey Mudd's full-time student requirements (12 credit hours). While abroad, students normally take a course load equivalent of four to five Harvey Mudd semester courses (15–16 credit hours), whether or not they need the credits to graduate. Students are allowed to take up to 18 credits while abroad. If students would like to overload, they must petition the associate dean for academic affairs and SAC for approval.

Departmental approval is required for all courses to be counted toward their major or Humanities, Social Sciences, and the Arts concentration and is also a requirement to go abroad. For this reason, students should discuss course selection with both faculty advisors. It is highly recommended that students retain all syllabi, reading lists, copies of submitted work, including all papers and exams as a record of academic performance abroad.

All courses taken while studying abroad are to be taken for a grade unless the course is only offered on a Pass/Fail credit basis. Credit will be awarded only on grades of C or better for HSA and B or better for courses to fulfill major requirements. Students must verify the departmental minimum grade requirements. Students are required to petition their major department for grades that fall below the minimum requirement.

All grades earned will appear on the Harvey Mudd transcript, but the grades will not be computed into the Harvey Mudd cumulative GPA. It is the student's responsibility to consult with his or her academic advisors to affirm the applicability of the proposed coursework. Any changes from this plan should be communicated, in writing, to the advisor and to Study Abroad staff. The College's acceptance of coursework taken abroad is contingent upon approval by the student's major department, the Humanities, Social Sciences, and the Arts Department and the registrar. For further information refer to the Study Abroad website.

Application Process
Acceptance to most programs is a two-step process requiring both Harvey Mudd and the program sponsor or host institution approval. Below is the process for applying to study abroad at Harvey Mudd.

- Attend a Harvey Mudd College Study Abroad Information Session
- Meet with study abroad advisors
- Meet with study abroad academic advisors
- Submit the Intent to Study Abroad form
- Submit the Harvey Mudd College Study Abroad application
- Submit the Program Sponsor application.

Credit toward graduation from Harvey Mudd is granted only to participants in programs of study officially approved by the SAC.

Application Forms
In addition to Harvey Mudd applications, most students will need to complete a Secondary Application required by their program sponsor. Students are responsible for obtaining and submitting the appropriate forms to Study Abroad and the program sponsor, when applicable, by the deadline. Information on obtaining these applications is available in the "Applicants" section of the Study Abroad website.

Deadlines
As a reminder, students interested in going abroad should apply for most programs in the semester preceding their proposed term abroad. The Harvey Mudd Study Abroad Application is accessible on the Study Abroad website. The Harvey Mudd Application, along with the Secondary Program Sponsor Application, must be submitted by the appropriate deadline.

Notification and Acceptance
The OSA will notify students of the SAC's decisions. Notification is emailed to the student's Harvey Mudd campus email usually before fall break or spring vacation. SAC approval does not guarantee final acceptance to a study abroad program. Participation in the program is contingent upon approval by the program sponsor and continued good academic standing in the current semester. This includes satisfactory completion of all program prerequisite courses and related language courses. In addition, students should maintain the GPA required for the program.

Accepted students must return a signed contract indicating their intent to participate. It is important that students submit all required OSA forms and respond to all requests from the program sponsor in a timely manner. Failure to do so may result in automatic withdrawal from the program.

Student Conduct
All students accepted for studying abroad affirm their understanding that they must conform to rules and regulations not only of Harvey Mudd, but also of the program and the country in which they study. Failure to do so may result in the student being immediately discharged from the program and returned home, at their expense, without a refund of program fees.

Health and Safety
All students participating in study abroad are required to carry their own comprehensive health insurance. Students with pre-existing illnesses should inquire about supplemental insurance while abroad. A list of students approved by Harvey Mudd Study Abroad will be forwarded to the Harvey Mudd dean of students, the Harvey Mudd registrar and to Monsour Counseling and Psychological Services of The Claremont Colleges.

Students accepted for studying abroad affirm the additional academic and personal risk involved and recognize as well the limited responsibility of the College for such programming. Before final approval for participation is given, each applicant must complete the Waiver, Release and Indemnification Agreement that outlines the limits of the College's liability.

DEPARTMENTS AND PROGRAMS

BIOLOGY

(See also Mathematical and Computational Biology and Joint Major in Chemistry and Biology)

Professors Adolph (Chair), Ahn, Bush, Donaldson-Matasci, Haushalter, Hur, McFadden and Stoebel

The biology program prepares graduates for further study and employment in biology and related fields. Biology graduates work in molecular genetics, neurobiology, mathematical ecology, medicine, epidemiology, plant physiology, bioinformatics, pharmacology, biotechnology, systems biology, veterinary medicine, forensic science, evolutionary biology, science teaching, science writing and other areas.

The Harvey Mudd biology major, in conjunction with the common technical Core, provides the topical breadth that is the foundation of modern biology and the intellectual depth that enables students to understand how discoveries in the life sciences are made and communicated. A set of required Biology Core courses provides a broad foundation in biology. Building on this foundation, each student, in consultation with a biology faculty advisor, selects a group of advanced biology and related technical courses that introduce a life sciences subdiscipline in depth. In addition to Harvey Mudd courses, students may draw upon the extensive course offerings at Pomona College, the Keck Science Department of Claremont McKenna, Pitzer and Scripps colleges, the Keck Graduate Institute of Applied Life Sciences and the Rancho Santa Ana Botanic Garden.

BIOLOGY MAJOR REQUIREMENTS. A biology major must successfully complete the following courses:

BIOLOGY CORE

Biology 54. **BIOLOGY LABORATORY**
Biology 101. **COMPARATIVE PHYSIOLOGY**
Biology 108. **ECOLOGY & ENVIRONMENTAL BIOLOGY**
Biology 109. **EVOLUTIONARY BIOLOGY**
Biology 113. **MOLECULAR GENETICS**
Biology 154. **BIOSTATISTICS**
Chemistry 56. **CARBON COMPOUNDS**
Chemistry 58. **CARBON COMPOUNDS LABORATORY**
Chemistry 105. **ORGANIC CHEMISTRY**

Biology Electives

Eleven credits of advanced biology, selected by the student and advisor, to include at least two Harvey Mudd laboratory courses (selected from Biology 103, 110, 111, 128, 166, 184) and one Harvey Mudd seminar-style course (requiring student presentations and reading from the primary literature, for example, Biology 121, 122, 164, 183, most offerings of 185/186, 189). Related non-biology technical courses may be substituted for advanced biology courses with permission of the department. With prior departmental permission, up to two credits of Biology 197/198 (Directed Reading) may count as Biology Electives

Colloquium
Four semesters of Biology 191–192: Biology Colloquium.
(The colloquium requirement is waived for any semester during which a student is away on a study abroad program.)

Capstone Project
Two semesters (at least 6 credits total) of Senior Thesis Research (Biology 193–194, or Biology 195–196) or an approved biology-related Clinic (Computer Science 183–184, Engineering 111–113, Mathematics 193 or Physics 193–194).

MOLECULAR BIOLOGY OPTION

Students may also select the molecular biology option within the biology major. A student seeking to complete the molecular biology option must satisfactorily complete the following courses:

MOLECULAR BIOLOGY CORE
Biology Core from above, plus the following additional courses and modified requirements:
Biology 111. **MOLECULAR BIOLOGY LABORATORY**
Biology 122. **CELL AND DEVELOPMENTAL BIOLOGY**
Biology 182. **CHEMISTRY IN LIVING SYSTEMS**
Chemistry 51. **PHYSICAL CHEMISTRY**
Chemistry 111. **ORGANIC CHEMISTRY LABORATORY**

Electives
Six credits of advanced biology electives, selected by the student and advisor, to include at least one Harvey Mudd laboratory course (Biology 103, 110, 128, 166, 184) and one Harvey Mudd seminar-style course (requiring student presentations and reading from the primary literature, for example, Biology 121, 122, 164, 183, most offerings of 185/186, 189). One chemistry course may be substituted for an advanced biology course with the prior approval of the department.

Colloquium
Four semesters of Biology 191–192: Biology Colloquium, or Chemistry 199: Chemistry Seminar. (The colloquium requirement is waived for any semester during which a student is away on a study abroad program.)

Capstone Project
Two semesters (at least 6 credits total) of Senior Thesis Research (Biology 193–194 or Biology 195–196 or Chemistry 151–152), or an approved biology-related Clinic (Computer Science 183–184, Engineering 111–113, Mathematics 193 or Physics 193–194).

JOINT MAJOR IN CHEMISTRY AND BIOLOGY

Important opportunities are emerging at the interface of chemistry and biology. The Joint Major in Chemistry and Biology provides an organized framework in which students will be able to appreciate the biological context of their research questions and master the chemistry fundamentals that underlie the properties and reactions of biomolecules. Students interested in the Joint Major, which is administered by the Departments of Biology and Chemistry, should contact the Chairs of Biology and Chemistry.

ENVIRONMENTAL BIOLOGY

Harvey Mudd College is part of a consortium that enables Harvey Mudd students to participate in the Semester in Environmental Science (SES) at the Ecosystems Center of the Marine Biological Laboratory, Woods Hole, Massachusetts. This semester-long program emphasizes interdisciplinary, inquiry-based approaches to the in-depth study of both aquatic and terrestrial ecosystems. Biology 171 and 173 are only offered as part of this program. Students interested in this program should contact Professor Catherine McFadden for information and applications. The Department of Biology also participates in the Harvey Mudd Center for Environmental Studies, which coordinates research and other activities in environmental studies. For more information, contact Professors Stephen Adolph or Catherine McFadden.

MATHEMATICAL AND COMPUTATIONAL BIOLOGY MAJOR

Applications of mathematics and computer science are vital to many areas of contemporary biological and medical research, such as genomics, molecular modeling, structural biology, ecology, evolutionary biology, epidemiology, neurobiology and cancer treatment. Students interested in the connections between biology and computer science and mathematics may pursue the Mathematical and Computational Biology major, which is jointly administered by the departments of Biology, Computer Science and Mathematics. For more information contact Professors Stephen Adolph, Eliot Bush, Lisette de Pillis (Mathematics) or Ran Libeskind-Hadas (Computer Science).

HEALTH PROFESSIONS

An excellent pre-medical preparation can be obtained at Harvey Mudd. In fact, the College's emphasis on the humanities, social sciences and the arts is a valuable asset for pre-medical studies. While there is no specific pre-medical curriculum, a pre-medical program can be arranged through any of the majors, if supplemented by appropriate biology and chemistry course work. Most medical schools require, as a minimum, one year of physics and biology and four semesters of chemistry, including organic chemistry. Students interested in medicine or related fields, such as dentistry or veterinary medicine, should contact the pre-professional coordinator, Professor James Eckert (Physics).

FACILITIES

The biology department is housed in the F.W. Olin Science Center, which provides exceptionally well-equipped teaching and research laboratories to support our curriculum. The Robert J. Bernard Biological Field Station, located directly across the street from Harvey Mudd College, is the natural laboratory for field biology courses and student-faculty research. Automated DNA sequencing is carried out at the adjacent Rancho Santa Ana Botanic Garden.

RESEARCH

Areas available for student-faculty research within the department include behavioral ecology, biochemistry, cellular and developmental biology, molecular genetics, population biology, physiological ecology, biomechanics, animal locomotion, tissue engineering, neuroscience, animal behavior, molecular systematics, bioinformatics, mathematical ecology, computational genetics and molecular evolution. Students wishing to pursue research prior to their senior year may enroll in Biology 161–162, Research Problems, or Biology 197–198, Directed Reading. Summer research positions are also available. Contact the Department of Biology research coordinator, Professor Dan Stoebel, for details and applications.

BIOLOGY COURSES (BIOL)

52. INTRODUCTION TO BIOLOGY (3)
Adolph, Bush, Donaldson-Matasci, Hur. Topics in genetics, molecular biology and evolution. Prerequisites: Computer Science 5 or equivalent, one semester of general chemistry and one semester of calculus. (Spring)

54. BIOLOGY LABORATORY (1)
Ahn, McFadden, Stoebel. Investigations in physiology, biochemistry, ecology, molecular biology and other areas of experimental biology. Corequisite: Biology 52. Concurrent requisite: Biology 154. (Spring)

81, 82. CURRENT ISSUES IN BIOLOGY (3)
Staff. Study of a biological topic of current importance to society. Active participation and discussion are stressed. (May not be counted for credit toward the biology major.) Prerequisite: Depends upon topic. (Fall or Spring)

95. FOUNDATIONS OF NEUROSCIENCE (3)
Staff. Introduction to the biological bases of human and animal behavior. Analysis of modern neurobiological approaches within a framework established by philosophical and historical traditions in the neurosciences. This course is jointly taught by Claremont Colleges Neuroscience faculty. (May not be counted for credit toward the biology major.) (Fall)

101. COMPARATIVE PHYSIOLOGY (3)
Ahn. Topics in the structural basis underlying general physiological mechanisms of plants and animals. Prerequisite: Biology 52. (Spring)

103. COMPARATIVE PHYSIOLOGY LABORATORY (2)
Ahn. Experimental techniques and concepts in plant and animal physiology, including the general areas of cellular biology, energetics, ionic regulation and signaling. The final third of the course will involve independent student research projects culminating with oral and written presentations of experimental investigations. Prerequisites: Biology 54, Biology 101. (Fall)

108. ECOLOGY AND ENVIRONMENTAL BIOLOGY (3)
Adolph, McFadden. Principles of organization of natural communities and ecosystems, including population dynamics, species interactions and island biogeography. Modern experimental and mathematical approaches to ecological problems. Application of ecological principles to conservation biology, human demography and harvesting of natural resources. Prerequisites: Biology 52 and Mathematics 30 or permission of instructor. (Spring)

109. EVOLUTIONARY BIOLOGY (3)
Adolph, McFadden. Evolutionary mechanisms, including natural selection, population genetics, speciation and macroevolutionary processes. Modern methods of phylogenetic reconstruction. History of biological diversity and the fossil record. Prerequisite: Biology 52 or permission of instructor. (Fall)

110. EXPERIMENTAL ECOLOGY LABORATORY (3)
Donaldson-Matasci. Design and analysis of ecological experiments with an emphasis on hypothesis testing, sampling techniques and computer-based statistical analysis of data. Most projects are field-based, designed to address aspects of population, community, physiological and behavioral ecology in animals and plants; work in both terrestrial and aquatic habitats. Includes several all-day field trips to local coastal, desert and mountain sites. Prerequisites: Biology 54 and 154 or permission of instructor. Corequisite: Biology 108. (Spring)

111. MOLECULAR AND CELLULAR BIOLOGY LABORATORY (2)
Hur. Basic techniques of molecular biology, including restriction mapping, DNA cloning, protein expression, and fluorescence microscopy. Prerequisites: Biology 54 and 154 or permission of instructor. Corequisite: Biology 113. (Fall)

113. MOLECULAR GENETICS (3)
Stoebel. Molecular description of gene function in both prokaryotic and eukaryotic cells, including DNA, RNA and protein structure; DNA replication; transcription and translation; and gene regulation. Prerequisites: Biology 52, Chemistry 23. (Fall)

115. NEUROBIOLOGY (3)
Glater. Basic principles of neuroscience including neuroanatomy, cellular and molecular mechanisms of neuronal function, nervous system development and functional organization of sensory systems. Prerequisites: Biology 52. (Spring)

119. ADVANCED MATHEMATICAL BIOLOGY (2) (Also listed as Mathematics 119)
Adolph, de Pillis (Mathematics), Jacobsen (Mathematics), Levy (Mathematics). Advanced study of mathematical models of biological processes, including discrete and continuous models. Examples are drawn from a variety of areas of biology, which may include physiology, systems biology, cancer biology, epidemiology, ecology, evolution and spatiotemporal dynamics. Prerequisite: Mathematical and Computational Biology 118A, permission of instructor. (Fall)

121. MARINE ECOLOGY (3)
McFadden. Advanced ecology focusing on marine communities. Dispersal, recruitment, competition, disturbance, plant/animal interactions and other topics. Readings in the primary literature. Counts as a seminar course for Biology majors. Prerequisite: Biology 108 or permission of instructor.

122. CELL AND DEVELOPMENTAL BIOLOGY (3)
Hur. Cellular and molecular mechanisms of animal development, including cell fate determination, morphogenesis and pattern formation. Emphasis on modern experimental organisms and approaches. Prerequisite: Biology 113 or equivalent or permission of instructor.

126. BIOLOGY OF PROKARYOTES (3)
Staff. Current topics in prokaryotic biology jointly selected by students and instructor. Emphasis on molecular mechanisms of adaptation to diverse environments. Primarily seminar format with readings from the primary literature. Prerequisite: Biology 113 or permission of instructor.

128. PROKARYOTES LABORATORY (2)
Staff. Techniques for isolating, identifying and characterizing bacteria from diverse environments. Prerequisites: Biology 54 and 154. Corequisite: Biology 126.

154. BIOSTATISTICS (2)
Stoebel. Statistical techniques for analyzing biological data, including parametric, nonparametric, and randomization methods. Statistical aspects of experimental design with an emphasis on analyzing data collected in Biology 54 (Introductory laboratory). Prerequisites: Computer Science 5 and Mathematics 35. Corequisite: Biology 52. Concurrent requisite: Biology 54.

161, 162. RESEARCH PROBLEMS (1-3)
Staff. Original experimental investigations in biology undertaken in consultation with a faculty member. (May not be counted for credit toward the biology major.) Prerequisite: permission of instructor. 1 credit hour for each 3 hours of laboratory per week. Pass/No Credit grading. (Fall and Spring)

164. GENETICS (3)
Stoebel. Current topics in genetics and developmental genetics. Emphasis on experimental techniques and design with model experimental organisms. Readings from the primary literature. Counts as a seminar course for biology majors. Prerequisite: Biology 113.

166. CELL BIOLOGY AND GENETICS LABORATORY (2)
Staff. Techniques for investigations of protein localization, organelle isolation, genetic mapping and fluorescence microscopy. Laboratories consist of student projects. Prerequisites: Biology 54, 113 and 154. Corequisite: Biology 164 or permission of instructor.

171. ANALYSIS OF AQUATIC ECOSYSTEMS. (4)
MBL Staff. The nature and controls of ecosystem processes (production, decomposition, element cycling and biogeochemistry) in freshwater, estuarine and marine ecosystems. Application of basic principles of ecosystems ecology to contemporary environmental problems such as coastal eutrophication, fisheries exploitation, effects of introduced species, acid deposition and global change. Includes lecture, discussion, laboratory and field work. Prerequisites: Biology 52, 54, 154, Chemistry 23 and Mathematics 30. (Fall) Offered only through the Semester in Environmental Science Program at the MBL Ecosystems Center, Woods Hole, Massachusetts.

173. ANALYSIS OF TERRESTRIAL ECOSYSTEMS (4)
MBL Staff. Fundamental biogeochemical processes in fields, pastures, tundra and forested ecosystems. Physiological ecology of land—plants and soil organisms in an ecosystems context. Impacts of environmental change on the landscape at local, regional and global scales. Includes lecture, discussion, laboratory and field work. Prerequisites: Biology 52, 54, Chemistry 23, 24 and Mathematics 30. (Fall) Offered only through the Semester in Environmental Science Program at the MBL Ecosystems Center, Woods Hole, Massachusetts.

174. BIOPHYSICS (2) (Also listed as Physics 174)
Gerbode (Physics). Selected topics in biolocomotion focusing on active research in the field. Possible topics include: bacteria motility, insect flight, water-walking, plant motions and slithering. Seminar format emphasizing oral presentations and group discussion. Prerequisites: Biology 52 and Physics 51. (Spring)

182. CHEMISTRY OF LIVING SYSTEMS (3) (Also listed as Chemistry 182)
Haushalter, Vosburg (Chemistry). Relation of molecular structure and energy flow to reactions in living systems. Prerequisite: Chemistry 105. (Spring)

183. TOPICS IN PHYSIOLOGY (3)
Ahn. Readings from the primary literature in animal physiology. Specific topics may vary. Counts as a seminar course for Biology majors. Prerequisite: Biology 101 or permission of instructor. (Fall, alternate years)

184. METHODS IN BIOCHEMISTRY (1) (Also listed as Chemistry 184)
Haushalter, Vosburg (Chemistry). Experiments in biochemistry. Corequisite: Biology/Chemistry 182. (Spring)

185, 186. SPECIAL TOPICS IN BIOLOGY (1.5–3)
Staff. Topics in a particular area of biology, depending on the instructor. Prerequisites: Biology 52 and possibly other courses. (Fall and Spring)

187. HIV-AIDS: SCIENCE, SOCIETY AND SERVICE (3) (Also listed as Chemistry 187 and Science, Technology, and Society 187)
Haushalter. Molecular biology of HIV infection. Biochemical basis for antiretroviral therapy and HIV prevention strategies. The causes and impact of the global HIV-AIDS pandemic, including the interrelationships among HIV-AIDS, prejudice, race and stigma. Students will complete a community service project in partnership with a local AIDS organization. Prerequisites: Biology 113, Biology 182/Chemistry 182 or permission of instructor.

188. ADVANCED COMPUTATIONAL BIOLOGY (3)
Bush. Computational algorithms and methods used in the study of genomes. Lectures, discussions and computer laboratory exercises. Prerequisites: Mathematical and Computational Biology 118B or Computer Science 70 or permission of instructor. (Fall, alternate years)

189. TOPICS IN BIOCHEMISTRY AND MOLECULAR BIOLOGY (3) (Also listed as Chemistry 189)
Haushalter, Stoebel. Advanced topics at the interface between chemistry and biology. Counts as a seminar course for Biology majors. Prerequisites: Biology 113, Biology 182/Chemistry 182 and senior standing or permission of instructor. (Fall)

190B. BIOMECHANICS (3) (Also listed as Engineering 190B)
Ahn, Orwin (Engineering). Mechanical properties of biological tissues, including bone, connective tissue and muscles. Static analysis of joints. Analysis of how muscle generates motion, leading to dynamics, including kinematics, kinetics and locomotion, and how these principles scale for different sized animals. Focus on applications and primary literature. Prerequisites: Biology 52 and Engineering 83 or permission of instructor. (Fall, alternate years)

191, 192. BIOLOGY COLLOQUIUM (0.5)
Staff. Oral presentations and discussions of selected topics including recent developments. Participants include biology majors, faculty members and visiting speakers. Required for junior and senior biology majors. No more than 2.0 credits of credit can be earned for colloquium. Pass/No Credit grading. (Fall and Spring)

193, 194. SENIOR THESIS RESEARCH (3)
Staff. A year-long experimental investigation in biology under the direction of a faculty advisor. Two oral presentations, a written proposal and a thesis are required. Required of all senior biology majors. Prerequisite: permission of instructor. (Fall and Spring)

195, 196. INTENSIVE RESEARCH (6)
Staff. Intensive experimental research in biology undertaken in consultation with a faculty member. Prerequisite: Biology 161, 162 or 193 and departmental approval of formal application. Replaces 3 credits of 193-194 and 3 credits of advanced biology courses for credit toward biology major. (Fall and Spring)

197, 198. DIRECTED READING (1-3)
Staff. Directed readings or independent laboratory research in selected topics in biology. With prior permission, up to 2 credits may count toward biology major. Prerequisite: permission of instructor. (Fall and Spring)

CHEMISTRY

(See also Joint Major in Chemistry and Biology)

Professors Karukstis (Chair), Cave, Daub, Haushalter, Hawkins, Johnson, Van Hecke, Van Heuvelen, Van Ryswyk and Vosburg.

The Department of Chemistry at Harvey Mudd College is consistently ranked as one of the top undergraduate chemistry programs in the nation. The chemistry curriculum is recognized for its unique program of study that builds on the broad, technical foundation that is acquired through the three-semester College-wide Core Curriculum. With coursework in all major areas of chemistry coupled with courses in mathematics, physics, biology, engineering and computer science, this unique program of study prepares students for professions in both traditional chemistry areas as well as cutting-edge interdisciplinary fields. Our laboratory curriculum gives students extensive hands-on experience with modern, sophisticated instrumentation and computation and features inquiry-driven, open-ended experiments that emphasize the process of discovery.

The flexibility of the major enables students to tailor their coursework to best match their career interests. An extensive range of advanced elective courses is available within the department and across The Claremont Colleges. The program of study is designed to give students the opportunity to conduct study abroad or pursue other academic or extracurricular interests. Courses in all major branches of chemistry can be completed by the end of the junior year giving students a broad spectrum of specialty areas in which to pursue the senior capstone requirement. Students may elect to fulfill the capstone experience through a wide variety of options including a research investigation, a team-based clinic project, a national laboratory collaboration or an industrial internship.

Students have abundant opportunities to engage in collaborative research with faculty beginning in the first year. Sustained involvement in multi-year projects is common. Students experience all facets of research, including the opportunity to present their work at national disciplinary conferences.

As a consequence of the depth of the chemistry major and the breadth of the College's technical core, our graduates pursue a myriad of careers and routinely achieve positions of leadership in their chosen fields. Students completing the chemistry major have a particularly strong and broad background for immediate employment, professional school (business, law or medicine), or graduate work in chemistry or a wide range of allied fields. Our alumni work not only in chemistry but also in materials science, chemical engineering, biochemistry, pharmacology, molecular biology, genetics, oceanography, teaching, publishing and viticulture. All chemistry graduates are certified by the American Chemical Society (ACS). The National Science Foundation recognizes the Harvey Mudd chemistry department as the top department in the nation whose undergraduates, per capita, ultimately earn a PhD in chemistry (www.thecollegesolution.com/the-colleges-where-phds-get-their-start/).

A second program, administered jointly by the departments of chemistry and biology, is the Joint Major in Chemistry and Biology. This joint major provides an opportunity for students interested in study at the interface between chemistry and biology. Students wishing to study such interdisciplinary areas as biochemistry, molecular biology, biological chemistry and chemical biology will find this program well-tailored to their career plans. Details on this program are listed in the Interdisciplinary Programs section of the catalogue.

Students completing the Joint Major in Chemistry and Biology graduate with a clear view of the science in both disciplines. Such a degree will prepare the graduate for immediate work or advanced study in molecular biology, biological chemistry, biochemistry or chemical biology. This major is not an ACS-certified chemistry major; students wishing to obtain ACS certification can do so by taking Chemistry 103, 104, 109, and either 114, 168B, 187, Chem 174 PO, Chem 175 PO, Chem 180 PO or Chem 181 PO.

CHEMISTRY MAJOR

The curriculum of our chemistry program approved by the American Chemical Society (ACS) provides both a broad background in the five traditional subdisciplines of chemistry (analytical, biochemistry, inorganic, organic and physical) and an in-depth study of chemistry that builds upon these foundational areas. Because chemistry is an experimental science, substantial laboratory work and research experiences are part of the curriculum. The standard chemistry program defined below is a comprehensive, rigorous curriculum to prepare students for professions in both traditional chemistry areas as well as cutting-edge interdisciplinary fields.

Harvey Mudd students also have the opportunity to pursue a specialized program of study within the chemistry major, known as a chemistry "emphasis," that tailors the required coursework to satisfy particular career objectives. Current emphases include Applied Chemistry (for those interested in careers in Chemical Engineering), Computational Chemistry, Environmental Chemistry, Materials Chemistry, and Geochemistry. Courses for these options are indicated in the table below.

Students may alternatively choose to design their own major emphasis (e.g., Physical Chemistry, Synthetic Chemistry, etc.). Coursework must satisfy the requirements of an ACS approved and HMC-certified degree as outlined below. A curriculum committee composed of Chemistry faculty members will work individually with majors to assist them in designing an appropriate set of courses for their chosen interest. Students should first consult with their advisor or the department chair to discuss their options.

STANDARD PROGRAM

Chemistry 51, 52, 53, 56, 58, 103, 104, 105, 109, 110, 111, 112, 114, four to six credit hours of Chemistry 151–152, Chemistry 182 and four semesters of Chemistry 199. The requirement for one semester of Chemistry 199 can be waived for students studying abroad in their junior or senior years.

CHEMISTRY EMPHASES

Like the standard program outlined above, specialized Chemistry emphases must satisfy the requirements of an ACS-approved and HMC-certified degree. Those requirements are:

- Five required foundation courses (51, 56, 103, 104, 182) and three required foundation laboratories (53, 58, 109) [19 units]
- One additional elective foundation laboratory – either 110 or 184 [1 unit]
- Eight units of elective, in-depth, non-laboratory courses (any non-laboratory chemistry course with a prerequisite of 51, 56, 103, 104 or 182 or non-laboratory courses in other departments with significant chemistry content beyond the level of the foundation courses listed above) [8 units]
- One elective advanced laboratory –111, 112 or 122 [1 unit]
- Four to six units of senior research (151–152) [4–6 units]
- Four semesters of 199 [2 units]
- Additional technical electives to reach a minimum of 37 units

The following table defines the curriculum that satisfies the Chemistry major emphases of Applied Chemistry (Chemical Engineering), Computational Chemistry, Environmental Chemistry, Materials Chemistry, and Geochemistry.

	Applied	Computational	Environmental	Materials	Geochemistry
Required Foundation Courses	51, 56, 103, 104, 182				
Required Foundation Laboratories	53, 58, 109				
Elective Foundation Laboratory	110 or 184				
In-depth, Non-laboratory Courses	114, 166 and 3 units among ENGR 82, 106 or 133	52 and 105 and 3 units from 114, 161, 168D or CHEM 134 KS	114 and 5 units from 193D, CHEM 188 PO, ENGR 190X	52, 105, 114	114, GEOL 120 PO and GEOL 127 PO
Advanced Laboratory	112 or 122	111 (with 105) or 112 (with 114)	112	111, 112 or 122	112
Senior Research	151–152				
Chem 199	Four semesters of 199				
Examples of courses, if needed, to reach 37 units (Not an exhaustive list; consult with your advisor)	112, 122, ENGR 82, 106, 131, 133, 231	111, 112, CS 60, ENGR 176, MATH 164 or PHYS 11	CHEM 106 PO or CHEM 139 KS	111, 112, 122, 193A, 193E, ENGR 106 or PHYS 162	GEOL 20A, B or D PO (one course is prerequisite for GEOL 120 and 127 PO)

PREMEDICAL STUDIES

An excellent premedical preparation can be obtained for both MD and PhD/MD programs. In fact, the College's technical Core and emphasis on the humanities, social sciences and the arts are assets for admission to medical studies. Harvey Mudd students completing either the Chemistry major or the Joint Major in Chemistry and Biology have successfully been admitted to both MD and PhD/MD programs. As early curriculum planning is recommended, students should inform their advisor as soon as possible if they wish to pursue medical school.

CHEMISTRY COURSES (CHEM)

23A. CHEMISTRY IN THE MODERN WORLD (3)
23B. CHEMISTRY IN THE MODERN WORLD (1.5)
Staff. Chemistry plays a powerful role in addressing an array of current and future global and societal challenges. This course examines contemporary applications of chemistry to describe innovative advances in such areas as energy, medicine, technology, materials, to name a few. These applications illustrate such fundamental concepts as molecular and electronic structure in dictating chemical and physical properties; intermolecular forces, phase behavior, thermodynamics, electrochemistry, kinetics and equilibria. Lecture and individual and group exercises conducted in class are used as a context for introducing chemistry principles. (23A offered Fall; 23B offered Spring first half-semester)

24. CHEMISTRY LABORATORY (1)
Staff. Applications of thermodynamics, equilibria, electrochemistry, structure/property relationships, synthesis and spectroscopy. (Fall and Spring)

40. INTRODUCTION TO CHEMICAL RESEARCH (1)
Staff. A rotation through multiple research laboratories in the chemistry department. Open to first-year students only. (Spring)

51. PHYSICAL CHEMISTRY: THERMODYNAMICS AND KINETICS (3)
Cave, Karukstis, Van Hecke. Applications of thermodynamics to chemical and phase equilibria. Chemical kinetics in the gas phase, in solution and on solid surfaces. Prerequisites: Chemistry 23A, 23B and 24. (Fall)

52. PHYSICAL CHEMISTRY: GROUP THEORY, QUANTUM CHEMISTRY AND SPECTROSCOPY (3)
Cave, Van Hecke. Chemical group theory. Introduction to quantum mechanics with application to atoms and molecules. Applications of group theory and quantum mechanics to spectroscopy. Prerequisites: Chemistry 51 or permission of the instructor. (Spring)

53. PHYSICAL CHEMISTRY LABORATORY (2)
Cave, Karukstis, Van Hecke. Physical and chemical measurements of molecular properties. Corequisite: Chemistry 51. (Fall)

56. CARBON COMPOUNDS (3)
Daub, Haushalter, Vosburg. A systematic study of the chemistry of carbon-containing compounds, emphasizing synthesis, reaction mechanisms, and the relation of structure to observable physical and chemical properties. Prerequisites: Chemistry 23A, 23B and 24. (Spring)

58. CARBON COMPOUNDS LABORATORY (1)
Daub, Haushalter, Johnson, Vosburg. Laboratory taken concurrently with Chemistry 56. Prerequisite: Chemistry 24 or instructor approval. Corequisite: Chemistry 56. (Spring)

103. CHEMICAL ANALYSIS (3)
Hawkins, Van Ryswyk. Applications of chemical equilibria in qualitative and quantitative analysis with emphasis on inorganic systems. Introduction to electrochemistry and chromatography. Prerequisites: Chemistry 23A, 23B and 24. (Fall)

104. INORGANIC CHEMISTRY (3)
Johnson, Van Heuvelen, Van Hecke. Systematic study of the preparation, properties, structures, analysis and reactions of inorganic compounds. Prerequisites: Chemistry 56; Chemistry 52 advised. (Spring)

105. ORGANIC CHEMISTRY (3)
Daub, Haushalter, Vosburg. A continuation of the chemistry of carbon compounds. Prerequisite: Chemistry 56. (Fall)

109. CHEMICAL ANALYSIS LABORATORY (1)
Hawkins, Van Ryswyk. Cooperative, project-based application of chemical analysis in a tropical marine ecosystem. Techniques include spectrophotometry, potentiometry, chromatography, and redox and complexometric titrations. Corequisite: Chemistry 103. (Fall)

110. INORGANIC CHEMISTRY LABORATORY (1)
Johnson, Van Heuvelen. Synthesis and characterization of inorganic compounds. Prerequisite: Chemistry 58. Corequisite: Chemistry 104. (Spring)

111. ORGANIC CHEMISTRY LABORATORY (1)
Daub, Haushalter, Johnson, Vosburg. Synthesis, characterization and analysis of organic compounds. Prerequisite: Chemistry 58. Corequisite: Chemistry 105. (Fall)

112. INSTRUMENTAL ANALYSIS LABORATORY (1)
Hawkins, Van Ryswyk. Application of advanced analytical techniques to food, pharmaceutical, materials, forensics, biochemical and archaeological problems. Techniques include atomic absorption spectroscopy, fluorescence, mass spectrometry, NMR, chromatography, voltammetry and a range of surface analyses. Prerequisite: Chemistry 109. Corequisite: Chemistry 114. (Spring)

114. ADVANCED ANALYTICAL CHEMISTRY (3)
Hawkins, Van Ryswyk. Fundamentals of modern instrumental design, application and usage with an emphasis on the underlying principles of operation. Chemometrics. Prerequisites: Chemistry 103; Engineering 59 advised. (Spring)

122. MATERIALS CHEMISTRY LABORATORY (1)
Van Ryswyk. New strategies for the synthesis and preparation of materials on the meso- and nanoscale, their characterization and potential applications. Examples may include solids (insulators, semiconductors, conductors, superconductors, magnetic materials) and soft materials (polymers, gels, liquid crystals). Prerequisite: Chemistry 52, Engineering 106 or Physics 56.

150. RESEARCH (1-2)
Staff. Prerequisites: Sophomore/junior standing and permission of instructor. (Fall and Spring)

151–152. RESEARCH PROBLEMS (2-3)
Staff. A yearlong experimental or computational investigation in chemistry under the direction of a faculty advisor. Two oral reports and a written thesis are required. Two or 3 credit hours per semester (2 credit hours equals a minimum of 6 hours of laboratory per week, 3 credit hours equals a minimum of 10 hours of laboratory per week: additional library time is required.) Prerequisite: Senior standing. (Fall and Spring)

161. ADVANCED PHYSICAL CHEMISTRY (2)
Cave, Van Hecke. Classical and statistical thermodynamics. Classical thermodynamics, a review of equilibrium thermodynamics and an introduction to statistical thermodynamics. Prerequisite: Chemistry 51 or equivalent.

165. ORGANOMETALLIC CHEMISTRY (2)
Johnson. Study of the metal carbon bond: synthesis, structure, bonding, reactivity and catalysis. Corequisite: Chemistry 105 or equivalent.

166. INDUSTRIAL CHEMISTRY (2)
Van Hecke. Elements of chemical engineering for chemists. Organization and goals of industrial research. Readings, case studies and seminar discussions. Prerequisite: Chemistry 51 or permission of the instructor.

168A. ADVANCED PHYSICAL CHEMISTRY: LASERS IN CHEMISTRY (2)
Van Hecke. Introduction to the principles of the operation of lasers. Prerequisite: Chemistry 52 or equivalent.

168B. ADVANCED PHYSICAL CHEMISTRY: BIOPHYSICAL CHEMISTRY (2)
Karukstis. Physical chemistry applied to answer questions involving the conformation, shape, structure, dynamics and interactions of biological macromolecules and complexes. Prerequisite: Chemistry 51 or equivalent.

168D. ADVANCED PHYSICAL CHEMISTRY: ELECTRONIC STRUCTURE THEORY (2)
Cave. An examination of modern methods for approximating the solution to the electronic Schroedinger Equation and its application to chemical systems. Prerequisite: Chemistry 52 or equivalent.

168E. ADVANCED PHYSICAL CHEMISTRY: ADVANCED GROUP THEORY (2)
Johnson, Van Hecke. A survey of topics selected from: space groups and crystals; permutation groups and molecular isomerization; rotation groups and angular momenta; double groups and magnetism; groups of non-rigid molecules; the symmetry of graphs. Prerequisite: Chemistry 52 or equivalent.

168F. ADVANCED PHYSICAL CHEMISTRY: SURFACE SCIENCE (2)
Van Ryswyk. Structure and chemical properties of surfaces as detailed by a range of analytical techniques. Prerequisite: Chemistry 52 or equivalent.

171. ADVANCED ORGANIC CHEMISTRY: ORGANIC SYNTHESIS (2)
Daub, Vosburg. Critical analysis of strategies for the preparation of medicinal natural products. Prerequisites: Chemistry 56 and 105 or equivalent.

173. ADVANCED ORGANIC CHEMISTRY: PERICYCLIC REACTIONS (2)
Daub, Vosburg. The application of molecular orbital theory and symmetry considerations to certain types of organic reactions in order to gain insight on the mechanisms and stereochemistry of the processes. Prerequisites: Chemistry 56 and 105 or equivalent.

182. CHEMISTRY IN LIVING SYSTEMS (3) (Also listed as Biology 182)
Haushalter, Vosburg. Relation of molecular structure and energy flow to metabolic reactions, signal transduction and transport across membranes in living systems. Prerequisites: Chemistry 56; Chemistry 105 advised. (Spring)

184. METHODS IN BIOCHEMISTRY (1) (Also listed as Biology 184)
Haushalter, Vosburg. Experiments in biochemistry. Corequisite: Chemistry 182. (Spring)

187. HIV-AIDS: SCIENCE, SOCIETY AND SERVICE (3) (Also listed as Biology 187 and Science, Technology, and Society 187)
Haushalter. The molecular biology of HIV infection, the biochemistry of antiviral interventions, and the causes and impact of the global HIV-AIDS pandemic, including the inter-relationships among HIV-AIDS, prejudice, race and stigma. Includes a community engagement project in partnership with a local organization. Prerequisites: Biology 113, Biology 182/Chemistry 182 or permission of instructor.

189. TOPICS IN BIOCHEMISTRY AND MOLECULAR BIOLOGY (3) (Also listed as Biology 189)
Staff. Advanced topics at the interface between chemistry and biology. Prerequisites: Chemistry 182/Biology 182 and senior standing. (Fall)

193. SPECIAL TOPICS IN CHEMISTRY (2)
A course devoted to exploring topics of current interest. Topics announced prior to registration. Junior/senior standing or instructor approval required. Prerequisites vary by topic. Recent topics include:

193A. *Van Ryswyk.* Materials science of energy conversion and storage, dealing with photovoltaics, fuel cells, batteries, thermoelectrics and other devices. Seminar format. Prerequisite: Chemistry 52, Engineering 106 or Physics 52. Crosslisted as Engineering 190D and Physics 178A.

193C. *Karukstis.* Exploring the U.S. Scientific Enterprise. A survey of how academia, industry, government and society constructively and collectively impact the scientific enterprise. Topics to be addressed include the roles of the individual investigator and the university in shaping science and spurring innovation; the importance of federal investment in basic research; science policy decision-making at the federal level; the objectives of the national laboratories; the role of and trends in corporate research and development; the rise of research, science and technology parks; public attitude toward science; public involvement in scientific research and in decision-making about scientific research directions; communication of scientific research in the media and via social media.

193D. *Hawkins.* Atmospheric Chemistry and Geoengineering is the intentional, large-scale modification of the Earth's climate. Current proposals for combating global climate change in the context of atmospheric chemistry will be evaluated for scientific merit, efficacy and likelihood of success. Ethical issues related to geoengineering will also be addressed. Prerequisite: Chemistry 51 or Engineering 80.

193E. *Van Hecke*. Chemistry of Modern Materials. A survey of how chemical structure influences the physical properties and applications of modern materials. Examples are selected from topics in crystalline materials, amorphous materials, semi-conductors, polymeric materials and nanomaterials. Prerequisites: Chemistry 51, Chemistry 56 and preferably Chemistry 52 and Chemistry 104 or permission of instructor.

193F. *Eckert, Van Hecke.* Physics and Chemistry of Stuff. A survey of techniques important for laboratory science in chemistry and physics, including, but not limited to: vacuum pumps and vacuum systems; pressure measurement; temperature measurement; handling high pressure gases; safe material handling; safety data sheets; thermal baths and thermal control; metal, plastic, and rubber tubing; tools and their proper use. Prerequisite: Junior or senior standing or permission of instructor.

193G. *Van Heuvelen.* Bioinorganic Chemistry. An examination of the role of metals in biological systems. Topics may include electron transport, small molecule activation, signaling pathways, metals in medicine, metals in environmental science, metal storage and trafficking, and bioinorganic chemistry and energy. Prerequisite: Chemistry 104 or permission of instructor.

197, 198. CHEMISTRY (1-3)
Staff. Special readings in chemistry. Open to juniors and seniors only. One to three credit hours per semester. (Fall and Spring)

199. SEMINAR (0.5)
Staff. Presentations of contemporary research by students, faculty and visiting scientists. Attendance by junior and senior majors is required. No more than 2.0 credits can be earned for departmental seminars/colloquia. Pass/No Credit grading. (Fall and Spring)

Available at the other Claremont Colleges:
CHEM 118 KS. BIOINORGANIC CHEMISTRY
CHEM 119 KS. NATURAL PRODUCTS CHEMISTRY
CHEM 124 KS. BIOANALYTICAL CHEMISTRY
CHEM 134 KS. INTRODUCTION TO MOLECULAR MODELING
CHEM 136 KS. MODERN MOLECULAR PHOTOCHEMISTRY
CHEM 139 KS. ENVIRONMENTAL CHEMISTRY
CHEM 172 KS. NMR SPECTROSCOPY
CHEM 106 PO. ENVIRONMENTAL CHEMISTRY

CHEM 172 PO. NMR SPECTROSCOPY
CHEM 174 PO. BIO-ORGANIC CHEMISTRY
CHEM 175 PO. INTRODUCTION TO MEDICINAL CHEMISTRY WITH COMPUTATIONAL LABORATORY
CHEM 180 PO. ADVANCED BIOCHEMISTRY
CHEM 185 PO. SOFT NANOMATERIALS
CHEM 187 PO. PROTEINS AND ENZYMES
CHEM 188 PO. ATMOSPHERIC CHEMISTRY
GEOL 20A PO. GEOHAZARDS
GEOL 20B PO. PLANETARY GEOLOGY
GEOL 20D PO. PALEONTOLOGY AND EVOLUTION OF EARTH'S BIOSPHERE
GEOL 120 PO. INTRODUCTION TO GEOCHEMISTRY
GEOL 127 PO. MINERALOGY WITH LABORATORY

COMPUTER SCIENCE

(See also Joint Majors in Computer Science and Mathematics, and Mathematical and Computational Biology)

Professors Professors Libeskind-Hadas (Chair), Boerkoel, Dodds, Erlinger, Keller, Kuenning, Lewis, Medero, O'Neill, Stone, Sweedyk, Trushkowsky and Wiedermann.

Computer science is an exciting and rapidly evolving discipline with components of cognitive science, design, logic, mathematics, engineering and philosophy. Computer science provides the logical infrastructure for our modern, information-based society.

The computer science major teaches the fundamental principles of the discipline through a blend of experimentation, theory, and design. We seek to prepare our graduates to make contributions to the field of computing, to computational aspects of science and engineering, and to society through research and development that has a positive social impact.

Each computer science major participates in a yearlong capstone Computer Science Clinic project, addressing real-world problems provided by sponsors from industry and research laboratories. A Clinic project typically comprises three to five students, supervised by a faculty member and a liaison from the sponsor, working on a project from "concept to product." More infomation on the Computer Science Clinic Program can be found at www.cs.hmc.edu/clinic.

Computer science students frequently engage in research with faculty mentors during the academic year and the summer in areas such as artificial intelligence, computational biology, databases, programming language design, robotics and others. A description of current and recent research projects can be found at www.cs.hmc.edu/research.

Graduates of the computer science program have gone on to work for a diverse set of employers ranging from startups to large companies and, in some cases, have started their own companies. A significant number of our majors have also gone on to graduate study. More information on our graduates is available at www.cs.hmc.edu/people/alumni.

All students at Harvey Mudd College are required to complete Computer Science 5 (Introduction to Computer Science) or an equivalent course, providing exposure to some major concepts in the discipline including functional programming, object-oriented programming, digital logic and computer organization, computability theory and societal issues.

The computer science major continues with the foundation courses, starting with Computer Science 60 (Principles of Computer Science), which provides a broader exposure to many areas of computer science and further develops fundamental competence in programming, logic, algorithm analysis and computer structure. Mathematics 55 is taken to develop skills in discrete mathematics that are needed for advanced computer science areas. Computer Science 70 (Data Structures and Program Development) improves the students' depth of programming competence and exposes computer science students to a diverse array of data structures and analysis techniques. Computer Science 81 (Computability and Logic) introduces the mathematical foundations of computer science, particularly logic, automata and computability theory, and demonstrates their applications to problems of practical significance.

The kernel courses build on the foundation. Computer Science 105 (Computer Systems) develops a deep understanding of computer structure and its relationship to correct and efficient program implementation. Computer Science 121 (Software Development) focuses on requirements analysis and specification techniques for large software systems and on the project management skills needed to develop such systems. Computer Science 131 (Programming Languages) investigates the concepts underlying a wide variety of modern programming languages. Computer Science 140 (Algorithms) develops fundamental skills needed to design and analyze algorithms for a variety of applications.

Topics such as concurrent and parallel computing, software testing, programming style,

maintainability, software tools, etc. are horizontally integrated across the CS curriculum. Finally, the broad array of computer science electives (more than 20 elective and seminar courses) allows students to achieve more specialization in areas of personal interest.

DEGREE REQUIREMENTS. A computer science major must complete the following courses:

Computer Science Foundation

Computer Science 60. **PRINCIPLES OF COMPUTER SCIENCE,** or
Computer Science 42. **PRINCIPLES AND PRACTICE OF COMPUTER SCIENCE**
Mathematics 55. **DISCRETE MATHEMATICS**
Computer Science 70. **DATA STRUCTURES AND PROGRAM DEVELOPMENT**
Computer Science 81. **COMPUTABILITY AND LOGIC**

Computer Science Kernel

Computer Science 105. **COMPUTER SYSTEMS**
Computer Science 121. **SOFTWARE DEVELOPMENT**
Computer Science 131. **PROGRAMMING LANGUAGES**
Computer Science 140. **ALGORITHMS**

Computer Science Clinic:

Two consecutive semesters of Computer Science 183, 184: **CLINIC**

Computer Science Colloquium

Four semesters of Computer Science 195: **COLLOQUIUM** are required and must be taken in the junior and senior years. Students studying abroad during their junior or senior years are excused from one semester of the colloquium requirement.

Three Computer Science Electives (9 credits)

The major requires nine units of upper-division Computer Science electives (numbered 100 or higher) other than colloquium and Clinic (which are also required for the major).

In addition, the department maintains a list of courses in other departments that may be counted as CS electives. The following courses have been approved to be taken as electives toward the Computer Science major. This list is not exhaustive and students should discuss other possible elective courses with their faculty advisor.

Math 104. **GRAPH THEORY**
Math 106. **COMBINATORICS**
Math 157. **INTERMEDIATE PROBABILITY**
Math 164. **SCIENTIFIC COMPUTING**
Math 165. **NUMERICAL ANALYSIS**
Math 185. **WAVELETS**
Math 187. **OPERATIONS RESEARCH**
Engineering 85. **DIGITAL ELECTRONICS AND COMPUTER ENGINEERING**
Engineering 115. **PROJECT MANAGEMENT**
Engineering 151. **ENGINEERING ELECTRONICS**
Engineering 155. **MICROPROCESSOR-BASED SYSTEMS: DESIGN AND APPLICATIONS**
Engineering 158. **INTRODUCTION TO CMOS VLSI DESIGN**
Engineering 161. **COMPUTER IMAGE PROCESSING AND ANALYSIS**
MCBI 118. **INTRO TO MATH & COMPUTATIONAL BIOLOGY**
Biology 188. **COMPUTATIONAL BIOLOGY**
Physics 84. **QUANTUM INFORMATION**
Physics 170. **COMPUTATIONAL METHODS IN PHYSICS**

OTHER DEPARTMENT CURRICULUM POLICIES

Other departmental curriculum policies can be found at www.cs.hmc.edu/program/policies.

CONCENTRATION IN COMPUTER ENGINEERING

Students frequently ask about the possibility of pursuing a computer engineering major at Harvey Mudd. Because the Department of Engineering offers a non-specialized engineering degree, students interested in computer engineering may wish to major in computer science. While the courses offered in the Computer Science Department are focused primarily on systems and software, appropriate engineering courses may be counted toward the elective course requirements of the computer science major.

COMPUTER SCIENCE MAJORS FROM THE OTHER CLAREMONT COLLEGES

Pomona College offers an undergraduate major in computer science; there is close cooperation between the Pomona and Harvey Mudd computer science departments.

Harvey Mudd welcomes computer science majors from the other Claremont Colleges. Students from the other colleges who desire to major in computer science at Harvey Mudd College should inform the chair of the Computer Science Department of their plans so that they may be assigned an appropriate advisor.

The Harvey Mudd computer science major assumes significant material included in the Harvey Mudd technical Core. In particular, it is assumed that students have taken courses in calculus, linear algebra and differential equations. Part of the advising process for an off-campus student involves identifying the courses that the student should take before enrolling in Harvey Mudd computer science courses.

COMPUTER SCIENCE COURSES (CSCI)

5. INTRODUCTION TO COMPUTER SCIENCE (3)

Dodds, Kuenning, Libeskind-Hadas. Introduction to elements of computer science. Students learn computational problem-solving techniques and gain experience with the design, implementation, testing and documentation of programs in a high-level language. In addition, students learn to design digital devices, understand how computers operate, and learn to program in a small machine language. Students are also exposed to ideas in computability theory. The course also integrates societal and ethical issues related to computer science. (Fall)

5GR. INTRODUCTION TO BIOLOGY AND COMPUTER SCIENCE (3)

Libeskind-Hadas, Bush (Biology). This course introduces fundamental concepts from the Core course Computer Science 5 using biology as the context for those computational ideas. Students see both the intellectual and practical connections between these two disciplines and write computer programs to explore biological phenomena. Biology topics include the basics of biochemistry, the central dogma, population genetics, molecular evolution, metabolism, regulation, and phylogenetics. Computer science material includes basic data types and control structures, recursion, dynamic programming, and an introduction to automata and computability. This course fulfills the computer science Core requirement at Harvey Mudd College. It does not fulfill the Harvey Mudd biology Core requirement. (Fall)

42. PRINCIPLES AND PRACTICE OF COMPUTER SCIENCE (3)

Keller, Stone, Wiedermann. Accelerated breadth-first introduction to computer science as a discipline for students (usually first-year) who have a strong programming background. Computational models of functional, object-oriented and logic programming. Data structures and algorithm analysis. Computer logic and architecture. Grammars and parsing. Regular expressions. Computability. Extensive practice constructing applications from principles, using a variety of languages. Successful completion of this course satisfies the Computer Science 5 Core requirement and Computer Science 60 coursework. Prerequisite: permission of instructor. (Fall)

60. PRINCIPLES OF COMPUTER SCIENCE (3)
Dodds, Lewis, Stone, Trushkowsky. Introduction to principles of computer science: Information structures, functional programming, object-oriented programming, grammars, logic, logic programming, correctness, algorithms and their analysis, computer organization and elements of the theoretical foundations of computer science. Those who have completed Computer Science 42 cannot take Computer Science 60. Prerequisite: Computer Science 5 or 5GR, or permission of instructor. (Fall and Spring)

70. DATA STRUCTURES AND PROGRAM DEVELOPMENT (3)
Medero, O'Neill, Stone, Wiedermann. Abstract data types including priority queues and dynamic dictionaries and efficient data structures for these data types, including heaps, self-balancing trees and hash tables. Analysis of data structures including worst-case, average-case and amortized analysis. Storage allocation and reclamation. Secondary storage considerations. Extensive practice building programs for a variety of applications. Prerequisites: Computer Science 60 or 42 and at least one mathematics course at the level of calculus or higher. (Fall and Spring)

81. COMPUTABILITY AND LOGIC (3)
Keller, Stone. An introduction to some of the mathematical foundations of computer science, particularly logic, automata and computability theory. Develops skill in constructing and writing proofs, and demonstrates the applications of the aforementioned areas to problems of practical significance. Prerequisites: Mathematics 55 and Computer Science 60 or 42. (Fall and Spring)

105. COMPUTER SYSTEMS (3)
Erlinger, Kuenning, Sweedyk, Trushkowsky. An introduction to computer systems. In particular the course investigates data representations, machine level representations of programs, processor architecture, program optimizations, the memory hierarchy, exceptional control flow (exceptions, interrupts, processes and Unix signals), performance measurement, virtual memory, system-level I/O and basic concurrent programming. These concepts are supported by a series of hands-on lab assignments. Prerequisite: Computer Science 70. (Fall and Spring)

111. DOMAIN-SPECIFIC LANGUAGES (3)
Wiedermann. This course explores how to design a new programming language. In particular, we'll focus on "Domain-Specific Languages"— languages designed for people who want to use a computer to perform a specialized task (e.g., to compose music or query a database or make games). Through readings, discussions and programming, we'll investigate why and how you would create a domain-specific language. The course also features a project that asks you to propose, design and implement your own domain-specific language. Prerequisite: Computer Science 70. (Fall)

121. SOFTWARE DEVELOPMENT (3)
Erlinger, Lewis. Introduction to the discipline concerned with the design and implementation of software systems. The course presents a historical perspective on software development practice and explores modern, agile techniques for eliciting software requirements, designing and implementing software architecture and modules, robust testing practices, and project management. Student teams design, develop and test a substantial software project. Prerequisite: Computer Science 70. (Fall and Spring)

124. INTERACTION DESIGN (3)
Boerkoel. This course introduces students to issues in the design, implementation and evaluation of human-computer interfaces, with emphasis on user-centered design and graphical interfaces. In this course, students learn skills that aid them in choosing the right user interaction technique and developing an interface that is well-suited to the people for whom it is designed. Prerequisite: Computer Science 60. (Spring)

125. COMPUTER NETWORKS (3)
Erlinger, Stone. Principles and analysis techniques for internetworking. Analysis of networking models and protocols. Presentation of computer communication with emphasis on protocol architecture. Prerequisite: Computer Science 105. (Fall)

131. PROGRAMMING LANGUAGES (3)
Keller, O'Neill, Stone. A thorough examination of issues and features in language design and implementation including language-provided data structuring and data-typing, modularity, scoping, inheritance and concurrency. Compilation and run-time issues. Introduction to formal semantics. Prerequisites: Computer Science 70 and 81. (Fall and Spring)

132. COMPILER DESIGN (3)
Stone. The design and implementation of compilers. Topics include elegant theoretical results underlying compilation techniques, practical issues in efficient implementation of programming languages, and bit-level interactions with operating systems and computer architectures. Over the course of the semester, students build a working compiler. Prerequisites: Computer Science 105 and 131 or permission of instructor. (Spring, alternate years)

133. DATABASES (3)
Trushkowsky. Fundamental models of databases: entity-relationship, relational, deductive, object-oriented. Relational algebra and calculus, query languages. Data storage, caching, indexing and sorting. Locking protocols and other issues in concurrent and distributed databases. Prerequisites: Computer Science 70 and 81; 131 recommended. (Fall, alternate years)

134. OPERATING SYSTEMS: DESIGN AND IMPLEMENTATION (3)
O'Neill. Design and implementation of operating systems, including processes, memory management, synchronization, scheduling, protection, file systems and I/O. These concepts are used to illustrate wider concepts in the design of other large software systems, including simplicity; efficiency; event-driven programming; abstraction design; client-server architecture; mechanism vs. policy; orthogonality; naming and binding; static vs. dynamic, space vs. time, and other trade-offs; optimization; caching; and managing large code bases. Group projects provide experience in working with and extending a real operating system. Prerequisite: Computer Science 105. (Spring, alternate years)

137. FILE SYSTEMS (3)
Kuenning. Computer storage and file systems. Characteristics of nonvolatile storage, including magnetic disks and solid-state memories. RAID storage. Data structures used in file systems. Performance, reliability, privacy, replication and backup. A major portion of the course is devoted to readings selected from current research in the field. Prerequisite: Computer Science 105. (Fall, alternate years)

140. ALGORITHMS (3) (Also listed as Mathematics 168)
Boerkoel, Libeskind-Hadas, Stone, Pippenger (Mathematics). Algorithm design, analysis, and correctness. Design techniques including divide-and-conquer and dynamic programming. Analysis techniques including solutions to recurrence relations and amortization. Correctness techniques including invariants and inductive proofs. Applications including sorting and searching, graph theoretic problems such as shortest path and network flow, and topics selected from arithmetic circuits, parallel algorithms, computational geometry, and others. An introduction to computational complexity, NP-completeness, and approximation algorithms. Proficiency with programming is expected as some assignments require algorithm implementation. Prerequisite: Computer Science 70 and Mathematics 55; Computer Science 81 recommended. (Students taking the course as Mathematics 168 have slightly different prerequisites.) (Fall and Spring)

142. COMPLEXITY THEORY (3) (Also listed as Mathematics 167)
Libeskind-Hadas, Pippenger (Mathematics). Brief review of computability theory through Rice's Theorem and the Recursion Theorem followed by a rigorous treatment of complexity theory. The complexity classes P, NP, and the Cook-Levin Theorem. Approximability of NP-complete problems. The polynomial hierarchy, PSPACE-completeness, L and NL-completeness, #P-completeness. IP and Zero-knowledge proofs. Randomized and parallel complexity classes. The speedup, hierarchy and gap theorems. Prerequisite: Computer Science 81. (Fall, alternate years)

144. SCIENTIFIC COMPUTING (3) (Also listed as Mathematics 164)
de Pillis (Mathematics), Yong (Mathematics). Computational techniques applied to problems in the sciences and engineering. Modeling of physical problems, computer implementation, analysis of results; use of mathematical software; numerical methods chosen from: solutions of linear and nonlinear algebraic equations, solutions of ordinary and partial differential equations, finite elements, linear programming, optimization algorithms and fast Fourier transforms. Prerequisites: Mathematics 65 and Computer Science 60 or 42. (Spring)

151. ARTIFICIAL INTELLIGENCE (3)
Boerkoel. A general introduction to the field of artificial intelligence, exploring the basic ideas and techniques underlying the design of intelligent computer systems. Introduction to topics such as knowledge representation, search, planning, learning and reasoning under uncertainty with applications to a variety of application domains. Prerequisites: Mathematics 35 and Computer Science 70. (Fall and Spring)

152. NEURAL NETWORKS (3)
Keller. Modeling, simulation and analysis of artificial neural networks and their relation to biological networks. Design and optimization of discrete and continuous neural networks. Back propagation and other gradient descent methods. Hopfield and Boltzmann networks. Unsupervised learning. Self-organizing feature maps. Applications chosen from function approximation, signal processing, control, computer graphics, pattern recognition, time-series analysis. Relationship to fuzzy logic, genetic algorithms and artificial life. Prerequisites: Computer Science 60 or 42 and Mathematics 65. (Fall)

154. ROBOTICS (3)
Boerkoel, Dodds. Introduction to algorithmic robotics. Topics span from sensor operation and low-level actuator control to architectures and algorithms for accomplishing tasks such as localization, navigation and mapping. The basic framework and analysis of both industrial and biologically-motivated robots are addressed. The laboratory component of the class provides experience in developing algorithms, programming and testing a range of robot behaviors on our hardware platforms. Prerequisite: Computer Science 60 or permission of instructor. (Spring)

155. COMPUTER GRAPHICS (3)
Sweedyk. This course introduces students to modern computer graphics. Topics include image processing, ray tracing and pipeline rendering, GPU processing, and 3D modeling. The course also covers a selection of recent research results. Students work on four substantial projects across the semester. Prerequisites: Computer Science 70 and Mathematics 30B/G. (Fall)

156. PARALLEL AND REAL-TIME COMPUTING (3)
Keller. Characteristics and applications for parallel and real-time systems. Specification techniques, algorithms, architectures, languages, design and implementation. Prerequisites: Computer Science 105 and 140; Computer Science 131 recommended. (Spring, alternate years)

157. COMPUTER ANIMATION (3)
Sweedyk. This course introduces students to the theory and practice of computer animation. The course covers the algorithms and data structures for building and animating articulated figures and particle systems including interpolation techniques, deformations, forward and inverse kinematics, rigid body dynamics, and physically based modeling. In addition, the course surveys the art, history and production of animation. Prerequisite: Computer Science 155. (Spring, alternate years)

158. MACHINE LEARNING (3)
Staff. An exploration of concepts and methods in machine learning including decision trees, Markov models and neural networks. Students will implement machine learning methods, read and discuss contemporary research articles in the field, and independently propose, research and implement a machine learning approach to a modern artificial intelligence problem. Prerequisites: Computer Science 151. (Fall, alternate years)

159. NATURAL LANGUAGE PROCESSING (3)
Medero. An introduction to the fundamental concepts and ideas in natural language processing, sometimes called computational linguistics. The goals of the field range from text translation and understanding to enabling humans to converse with robots. We will study language processing starting from the word level to syntactic structure to the semantic meaning of text. Approaches include statistical as well as symbolic methods using logic and the lambda calculus. Students will build and modify systems and will use large existing corpora for validating their systems. Prerequisites: Computer Science 70, Mathematics 60 and 65. (Spring, alternate years)

181. COMPUTER SCIENCE SEMINAR (1-3)
Staff. Advanced topics of current interest in computer science. Prerequisite: permission of instructor. (Fall and Spring)

183, 184. COMPUTER SCIENCE CLINIC I, II (3)
Staff. The Clinic Program brings together teams of students to work on a research problem sponsored by business, industry or government. Teams work closely with a faculty advisor and a liaison provided by the sponsoring organization to solve complex real-world problems. Students are expected to present their work orally and to produce a final report conforming to professional publication standards. Prerequisites: Computer Science 121 and senior standing or permission of the Computer Science Clinic director. (Fall and Spring; 183 and 184 must be taken consecutively to count toward the major.)

186. COMPUTER SCIENCE RESEARCH AND INDEPENDENT STUDY (0.5-3)
Staff. A research or development project under computer science faculty supervision. Prerequisite: permission of instructor. No more than 3 units can count toward major elective credit. (Fall and Spring)

189. PROGRAMMING PRACTICUM (1)
Dodds, Stone, Sweedyk. This course is a weekly programming seminar, emphasizing efficient recognition of computational problems and their difficulty, developing and implementing algorithms to solve them, and the testing of those implementations. Attention is given to the effective use of programming tools and available libraries, as well as to the dynamics of team problem-solving. Prerequisite: Computer Science 5, 5GR or 42 or permission of instructor. (May be taken for major elective credit up to three times.) (Fall and Spring)

195. COMPUTER SCIENCE COLLOQUIUM (0.5)
Staff. Oral presentations and discussions of selected topics, including recent developments in computer science. Participants include computer science majors, Clinic participants, faculty members and visiting speakers. No more than 2.0 credits can be earned for colloquia. Pass/No Credit grading. Juniors and seniors only. All majors welcome. (Fall and Spring)

ENGINEERING

Professors Orwin (Chair), Bassman, Bright, Cardenas, Cha, Clark, Dato, Durón, Furuya, Gokli, Harris, Krauss, Lape, Little, Remer, Spencer, Spjut, Wang, and Yang.

PROGRAM EDUCATIONAL OBJECTIVES

- Produce graduates who are exceptionally competent engineers whose work is notable for its breadth and its technical excellence;
- Provide a hands-on approach to engineering so that graduates develop an understanding of engineering judgment and practice;
- Prepare and motivate students for a lifetime of independent, reflective learning;
- Produce graduates who are fully aware of the impact of their work on society, both nationally and globally;
- Offer a curriculum that is current, exciting and challenging for both students and faculty but can be completed in four years by any motivated student who is admitted to Harvey Mudd.

Based on the premise that design is the distinguishing feature of engineering, the Harvey Mudd engineering program provides a broad-based, hands-on experience in engineering practice and synthesis as well as in analysis. Thus, the engineering program is designed to prepare graduates for professional practice, for advanced study in a specific engineering discipline, and for a lifetime of independent learning. Culminating in an unspecialized bachelor's degree, the program emphasizes an interdisciplinary approach to problem solving.

The engineering curriculum can be described as having three stems. The **engineering science stem** consists of five required courses (Engineering 82, 83, 84, 85 and 106) that collectively embody the fundamental "applied science" knowledge base needed by a broadly educated engineer practicing in the foreseeable future. A half course in engineering mathematics (Engineering 72) is also required for the engineering major.

The **systems stem** is a sequence of three required courses (Engineering 59, 101, 102) that provides analysis and design tools to model and interpret the behavior of general engineering systems. The sequence is multidisciplinary in approach, enabling students to gain a unified view of the entire spectrum of engineering disciplines.

The **design and professional practice stem** includes five required courses that focus on working in teams on open-ended, externally-driven design projects that, over the course of the curriculum, encompass conceptual design, preliminary (or embodiment) design, and detailed design. Hands-on exposure to professional practice begins with students undertaking challenging design problems in the first year with an introduction to conceptual design, engineering drawings, and manufacturing techniques (Engineering 4), continues with a laboratory course in experimental engineering (Engineering 80), and culminates with three semesters of Engineering Clinic (Engineering 111–113).

Pioneered by the Department of Engineering at Harvey Mudd College in 1963, the **Engineering Clinic** brings together teams of students to work with faculty advisors and external liaison engineers on carefully selected, industry- and government-sponsored design and development projects. The students plan and execute their projects; the faculty advise, coach, monitor, evaluate and provide feedback; the sponsors' liaisons ensure that the sponsors' goals are achieved and that the design experience corresponds as closely as possible to what engineers encounter in actual practice. Thus, the questions and problems that student teams face are typical of those regularly confronted by practicing engineers, and the solutions they devise must work in practice, not just in theory.

We believe that our broad engineering program graduates engineers capable of adapting changing technologies to expanding human needs, while at the same time being sensitive to the impact of their work on society. In this context, an engineering major may choose to

emphasize a particular engineering specialty by appropriate choice of elective courses and Engineering Clinic projects. Specific programs tailored to individual needs are developed in consultation with an engineering faculty advisor.

An engineering major must satisfactorily complete the following required courses for the bachelor's degree: Engineering 4, 59, 72, 80, 82, 83, 84, 85, 101–102, 106, 111–113, 122 and 124. In addition, three upper-division engineering technical electives are also required, and seniors must submit a final Clinic report that is acceptable to the project's faculty advisor. Students should note that many electives are offered in alternate years.

To keep the option open for majoring in engineering, a student should have taken Engineering 4 and 59 before the fourth semester. Any proposed variation from this program must be discussed in advance with an engineering advisor.

ENGINEERING COURSES (ENGR)

4. INTRODUCTION TO ENGINEERING DESIGN AND MANUFACTURING (4)
Orwin, staff. Design problems are, typically, open-ended and ill-structured. Students work in small teams applying techniques for solving design problems that are, normally, posed by not-for-profit clients. The project work is enhanced with lectures and reading on design theory and methods, and introduction to manufacturing techniques, project management techniques and engineering ethics. Enrollment limited to first-year students and sophomores, or by permission of the instructor. Prerequisite: Writing 1. (Fall and Spring)

11. AUTONOMOUS VEHICLES (3)
Clark, Durón, Harris, Lape. Interdisciplinary introduction to design and programming in the context of small autonomous vehicles. Topics and activities include: energy and sustainability; applied mechanics; sensors and actuators; constructing chemical, mechanical and electrical systems; embedded software development in C; a design competition. Enrollment limited to first-year Harvey Mudd students and any-year off-campus students (as space permits). (Fall)

13. ENERGY SYSTEMS ENGINEERING (3)
Staff. This course covers the science, engineering and policies of a variety of energy technologies capable of significant growth as well as an integrated systems approach to conceptualize, model and analyze energy projects and programs. Topics include energy technologies and systems associated with stationary combustion, nuclear power, transportation, wind, photovoltaic and solar thermal. Students collaborate to choose, design and develop a novel green product to address a sustainability need. (Fall)

59. INTRODUCTION TO ENGINEERING SYSTEMS (3)
Staff. An introduction to the concepts of modern engineering, emphasizing modeling, analysis, synthesis and design. Applications to chemical, mechanical and electrical systems. Prerequisite: sophomore standing. Corequisite: Physics 51. (Fall)

72. ENGINEERING MATHEMATICS (1.5) (Also cross-listed as Mathematics 110)
Bassman, Lape, Yong (Mathematics). Applications of differential equations, linear algebra, and probability to engineering problems in multiple disciplines. Mathematical modeling, dimensional analysis, scale, approximation, model validation, Laplace Transforms. Prerequisites: Mathematics 35 and Mathematics 65 or the equivalent. (Spring, first half)

80. EXPERIMENTAL ENGINEERING (3)
Staff. A laboratory course designed to acquaint the student with the basic techniques of instrumentation and measurement in both the laboratory and in engineering field measurements. Emphasis on experimental problem solving in real systems. Prerequisites: Engineering 59. Corequisite: Engineering 72. (Spring)

82. CHEMICAL AND THERMAL PROCESSES (3)
Bright, Cardenas, Lape, Spjut. The basic elements of thermal and chemical processes, including: state variables, open and closed systems, and mass balance; energy balance, First Law of Thermodynamics for reactive and non-reactive systems; entropy balance, Second Law of Thermodynamics, thermodynamic cycles and efficiency. (Fall and Spring)

83. CONTINUUM MECHANICS (3)
Bassman, Cardenas. The fundamentals of modeling continuous media, including: stress, strain and constitutive relations; elements of tensor analysis; basic applications of solid and fluid mechanics (including beam theory, torsion, statically indeterminate problems and Bernoulli's principle); application of conservation laws to control volumes. (Fall and Spring)

84. ELECTRONIC AND MAGNETIC CIRCUITS AND DEVICES (3)
Wang, Yang. Introduction to the fundamental principles underlying electronic devices and applications of these devices in circuits. Topics include electrical properties of materials; physical electronics (with emphasis on semiconductors and semiconductor devices); passive linear electrical and magnetic circuits; active linear circuits (including elementary transistor amplifiers and the impact of non-ideal characteristics of operational amplifiers on circuit behavior); operating point linearization and load-line analysis; electromagnetic devices such as transformers. (Fall and Spring)

85. DIGITAL ELECTRONICS AND COMPUTER ENGINEERING (3)
Harris. This course provides an introduction to elements of digital electronics, followed by an introduction to digital computers. Topics in digital electronics include: Boolean algebra; combinational logic; sequential logic; finite state machines; transistor-level implementations; computer arithmetic; and transmission lines. The computer engineering portion of the course includes computer architecture and micro-architecture: levels of abstraction; assembly-language programming; and memory systems. The digital electronics portion of Engineering 85 may be taken by non-engineering majors as a stand-alone half course under the number Engineering 85A. (Fall and Spring)

85A. DIGITAL ELECTRONICS (1.5)
Harris. This course provides an introduction to elements of digital electronics, intended for non-engineering majors who may be interested in pursuing other advanced engineering courses that require this background. Lectures for this course coincide with lectures for the first half of Engineering 85. (Fall and Spring)

91. INTERMEDIATE PROBLEMS IN ENGINEERING (1-3)
Staff. Independent study in a field agreed upon by student and instructor. Credit hours to be arranged.

101-102. ADVANCED SYSTEMS ENGINEERING (3)
Bright, Cha, Clark, Durón, Wang, Yang. Analysis and design of continuous-time and discrete-time systems using time domain and frequency domain techniques. The first semester focuses on the connections and distinctions between continuous-time and discrete-time signals and systems and their representation in the time and frequency domains. Topics include impulse response, convolution, continuous and discrete Fourier series and transforms, and frequency response. Current applications, including filtering, modulation and sampling, are presented, and simulation techniques based on both time and frequency domain representations are introduced. In the second semester additional analysis and design tools based on the Laplace- and z-transforms are developed, and the state space formulation of continuous and discrete-time systems is presented. Concepts covered during both semesters are applied in a comprehensive treatment of feedback control systems including performance criteria, stability, observability, controllability, compensation and pole placement. Prerequisite: Engineering 59 or permission of instructor. Three credit hours per semester. (Year-long sequence)

106. MATERIALS ENGINEERING (3)
Krauss, Dato. Introduction to the structure, properties and processing of materials used in engineering applications. Topics include: material structure (bonding, crystalline and non-crystalline structures, imperfections); equilibrium microstructures; diffusion, nucleation, growth, kinetics, non-equilibrium processing; microstructure, properties and processing of: steel, ceramics, polymers and composites; creep and yield; fracture mechanics; and the selection of materials and appropriate performance indices. Prerequisites: Physics 51, Engineering 82 and 83 or permission of instructor. (Fall and Spring)

111. ENGINEERING CLINIC I (3)
Harris, staff. Participation in engineering projects through the Engineering Clinic. Emphasis is on design of solutions for real problems, involving problem definition, synthesis of concepts, analysis and evaluation. Prerequisite: junior standing in engineering or permission of Clinic director. (Fall and Spring)

112-113. ENGINEERING CLINIC II-III (3)
Harris, staff. Participation in engineering projects through the Engineering Clinic. Emphasis is on design of solutions for real problems, involving problem definition, synthesis of concepts, analysis and evaluation. Prerequisites: Engineering 4, 80 and 111 or permission of Clinic director. Three credit hours per semester. (Fall and Spring)

114. ENGINEERING CLINIC (1-3)
Harris, staff. A continuation of Engineering Clinic for juniors who elect a second semester. Prerequisite: permission of Clinic director. (Spring)

115. PROJECT MANAGEMENT (3)
Little, Remer. This course teaches tools and techniques commonly used in managing engineering projects, including work breakdown structures, PERT/CPM analysis, and budgeting, forecasting and aspects of project control. It also introduces use of models and operations research techniques in selecting and assigning resources to projects. Students are required to develop and implement a work plan for a small-scale project, typically a Clinic project. (Fall)

116. COST ESTIMATION AND MODELING (3)
Remer. Principles of cost and schedule estimation and modeling for capital projects, and for estimation and budgeting of operations and maintenance of ongoing processes. Hardware and software and integrated design projects are included. Advantages and disadvantages of different estimation methods are explored. (Spring, alternate years)

117. ECONOMICS OF TECHNICAL ENTERPRISE (3) (Formerly Engineering 201)
Remer. Time value of money, interest rates, depreciation and depletion, personal and corporate taxes, investment yardsticks such as present worth, rate of return, payback period and cost/benefit analysis, venture analysis and comparison of alternative projects, cost estimation and inflation, personal economics and investments, current business economic topics, tempering economics with judgment. (Fall)

118. ENGINEERING MANAGEMENT (3) (Formerly Engineering 202)
Little, Remer. Introduction to the concepts of modern management including the scientific, behavioral and functional schools of thought, motivational models, leadership styles, organizational structures, project management, and other areas of student interest. (Not to be substituted for any technical elective required for the major.) Prerequisite: senior standing or permission of instructor. (Spring)

119. PRELIMINARY DESIGN (3)
Staff. This course examines the general principles associated with functional analysis and preliminary design and applies these principles to a particular design problem. Students in the course will be expected to demonstrate competency in the application of functional analysis techniques and setting of performance specifications, design of artifacts to meet the functional specifications, and documentation of successful designs. Students will be offered a choice of several design problems which may come from one of the traditional engineering disciplines (chemical, civil, electrical, mechanical, etc.) or may cut across several boundaries. (Fall, alternate years)

122. ENGINEERING SEMINAR (0.5)
Staff. Weekly meetings devoted to discussion of engineering practice. Required of junior engineering majors. Pass/No Credit grading. Juniors only. (Spring)

124. ENGINEERING SEMINAR (0.5)
Staff. Weekly meetings devoted to the discussion of engineering practice. Required of senior engineering majors. Pass/No Credit grading. Seniors only. (Spring)

131. FLUID MECHANICS (3)
Bright, Cardenas, Lape. Integrated approach to the subjects of fluid mechanics, heat transfer and mass transfer through the study of the governing equations common to all three fields. Applications drawn from a wide variety of engineering systems. Prerequisite: Engineering 83. (Fall)

133. CHEMICAL REACTION ENGINEERING (3)
Remer, Spjut. The fundamentals of chemical reactor engineering: chemical reaction kinetics, interpretation of experimental rate data, design of batch and continuous reactors for single and multiple reactions including temperature and pressure effects, and the importance of safety considerations in reactor design. (Fall, alternate years)

134. ADVANCED ENGINEERING THERMODYNAMICS (3)
Lape, Spjut. The application of classical thermodynamics to engineering systems. Topics include power and refrigeration cycles, energy and process efficiency, real gases and non-ideal phase and chemical reaction equilibria. Prerequisite: Engineering 82. (Spring, alternate years)

136. MASS TRANSFER AND SEPARATION PROCESSES (3)
Lape. Principles of mass transfer, application to equilibrium-stage and finite-rate separation processes. Extension of design principles to multistage systems and to countercurrent differential contacting operations. Applications from the chemical processing industries and from such fields as desalination, pollution control and water reuse. Prerequisite: Engineering 82. (Spring, alternate years)

138. INTRODUCTION TO ENVIRONMENTAL ENGINEERING (3)
Cardenas. Introduction to the main concepts and applications in modern environmental engineering. Included are surface and groundwater pollution (both classical pollutants and toxic substances); risk assessment and analysis; air pollution; and global atmospheric change. (Spring, alternate years)

151. ENGINEERING ELECTRONICS (3)
Yang. Analysis and design of circuits using diodes, bipolar junction transistors and field-effect transistors, following a brief treatment of solid state electronics and the physics of solid state devices. Analysis and design of single and multi-transistor linear circuits including operational amplifiers. Corequisite: Engineering 153. Prerequisites: Engineering 59 and 84 or permission of instructor. (Fall)

153. ELECTRONICS LABORATORY (1)
Yang. Experimental evaluation of electronic devices and circuits. Prerequisite: Engineering 84 or permission of instructor. Concurrent requisite: Engineering 151. (Fall)

155. MICROPROCESSOR-BASED SYSTEMS: DESIGN AND APPLICATIONS (4)
Harris. Introduction to digital design using programmable logic and microprocessors. Combinational and sequential logic. Finite state machines. Hardware description languages. Field programmable gate arrays. Microcontrollers and embedded system design. Students gain experience with complex digital system design, embedded programming, and hardware/software trade-offs through significant laboratory and project work. Prerequisites: Engineering 85; or Engineering 85A and Computer Science 60; or permission of instructor. (Fall)

156. INTRODUCTION TO COMMUNICATION AND INFORMATION THEORY (3)
Staff. Comprehensive treatment of explicit and random signal transmission through linear communication networks by generalized harmonic analysis including signal sampling and modulation theories. Treatment of noise in communication systems including design of optimum linear filters and systems for signal detection. Introduction to information theory including the treatment of discrete noiseless systems, capacity of communication channels and coding processes. Prerequisite: Engineering 101. (Spring)

158. INTRODUCTION TO CMOS VLSI DESIGN (3)
Harris. Introduction to digital integrated system design. Device and wire models, gate topologies, logical effort, latching, memories and timing. Structured physical design and CAD methodology. Final team project involves design and fabrication of custom chips. Prerequisites: Engineering 84 and 85/85A or permission of instructor. (Spring)

160. AUTONOMOUS ROBOT NAVIGATION (3)
Clark. This course introduces students to a variety of autonomous mobile robot platforms, but concentrates on differential drive-wheeled robots. Topics to be covered include robot platforms and kinematic modeling, control structures, sensing and estimation, localization, and motion planning. The course has a heavy experimental component that involves computer programming of the robots and physical experiments. Requirement: junior standing. (Spring)

161. COMPUTER IMAGE PROCESSING AND ANALYSIS (3)
Wang. An introduction to both image processing, including acquisition, enhancement and restoration; and image analysis, including representation, classification and recognition. Discussion on related subjects such as unitary transforms, and statistical and neural network pattern recognition methods. Project oriented. Prerequisites: Engineering 101-102 and programming proficiency, or permission of instructor. (Fall, alternate years)

164. INTRODUCTION TO BIOMEDICAL ENGINEERING (3)
Orwin. The application of engineering principles to help pose and solve problems in medicine and biology. Focus on different aspects, particularly biomedical measurements, biosystems analysis, biomechanics and biomaterials. (Spring, alternate years)

166. HIGH-SPEED PC BOARD DESIGN (3)
Staff. This course provides the student exposure to fundamental and practical issues in the design and fabrication of printed circuit boards (PCBs), with primary emphasis on boards for high-speed digital circuits. Students work in teams to design a high-speed PCB, which can then be fabricated and subsequently tested by the students. Upon completing this course, students should be able to use appropriate CAD tools to capture a circuit schematic, choose a board cross-section, place components on a board and route wiring. Further, the course should enable students to recognize when circuit speed/size combinations are likely to make

"high-speed effects" such as reflections and cross talk important, to know how to quantify these effects and their impact on performance, and to design their boards to reduce the deleterious effects to an acceptable level. Prerequisites: Engineering 84 and 85/85A. (Spring, alternate years)

168A. INTRODUCTION TO FIBER OPTIC COMMUNICATION SYSTEMS (3)
Yang. This course provides the fundamentals of optics and its applications in communication systems. The physical layer of optical communication systems will be emphasized. Topics include optical materials; dispersion and nonlinear effects; polarization and interference; and the basic elements of system implementation such as laser sources, optical amplifiers and optical detectors. The course will include a multiple channel system design. (Spring, alternate years)

171. DYNAMICS OF ELASTIC SYSTEMS (3)
Cha, Durón. Free and forced response of single-degree-of-freedom systems. Eigenvalue problem for multi-degree-of-freedom systems; natural modes of free vibration. Forced response of undamped and viscously damped, multi-degree-of-freedom systems by modal analysis. Prerequisite: Engineering 83. (Fall)

172. STRUCTURAL MECHANICS (3)
Bassman, Cha. Introduction to elementary structural systems: trusses, beams. Force and deflection analysis. Energy methods. Stability. Introduction to finite element methods. Prerequisite: Engineering 83. (Spring)

173. APPLIED ELASTICITY (3)
Staff. Introduction to the concepts of stress and strain. Application to the theory of bending and torsion. Topics in elementary elasticity. Prerequisite: Engineering 83. (Fall, alternate years)

174. PRACTICES IN CIVIL ENGINEERING (3)
Little, Cardenas. The student is exposed to the practice of civil engineering through a series of case studies discussed within the context of a broad-based engineering curriculum. Engineering fundamentals related to the selection and use of construction materials, stress and strain, and to the analysis and design of structural and transportation systems may be discussed. Types and specifics of case studies vary depending upon the instructor. Prerequisites: Engineering 59, 80 and permission of instructor. (Spring, alternate years)

175. DYNAMICS OF RIGID BODIES (3)
Bassman. Kinematics, mass distribution and kinetics of systems of particles and rigid bodies. Formulation of equations of motion with: Newton/Euler equations; angular momentum principle; power, work and energy methods. Numerical solutions of nonlinear algebraic and ordinary differential equations governing the behavior of multiple degree of freedom systems. Computer simulation of multi-body dynamic systems. Construction of physical systems for comparison with simulation. Corequisite: Engineering 83. (Fall)

176. NUMERICAL METHODS IN ENGINEERING (3)
Cha, Wang. This course focuses on the application of a variety of mathematical techniques to solve real-world problems that involve modeling, mathematical and numerical analysis, and scientific computing. Concepts, calculations and the ability to apply principles to physical problems are emphasized. Ordinary differential equations, linear algebra, complex analysis, numerical methods, partial differential equations, probability and statistics, etc., are among the techniques that would be applied to problems in mechanical, electrical, chemical and civil engineering. Examples are drawn from fluid mechanics, heat transfer, vibration of structures, electromagnetics, communications and other applied topics. Program development and modification are expected as well as learning to use existing code. Prerequisite: Engineering 72.
(Spring, alternate years)

179. DEFORMATION AND FRACTURE OF SOLIDS (3)
Staff. Elements of stress and strain, elastic and plastic deformations of solid materials, fracture mechanics, strengthening mechanisms, thermal and thermo-mechanical processing, effects of microstructure, failure modes and analysis of service failures. Prerequisites: Engineering 83 and 106. (Fall, alternate years)

181. NEW PRODUCT DEVELOPMENT (3)
Krauss. This course will introduce the theory and practice of a process used for new product development that considers design, management and manufacturing components. Students will identify needs (market or humanitarian) amenable to an engineered product solution, select and scope the project need they will address, quantify the impact of a solution through a business case, design and develop multiple prototype solutions, validate the resulting product and solicit funding for a launch. Prerequisite: Engineering 4 or permission of instructor. (Spring)

182. MANUFACTURING PLANNING AND EXECUTION (3)
Gokli. This course provides a fundamental understanding of manufacturing and focuses on "practical" elements of how factories are laid out, how they are optimized and how they are managed and measured. It introduces students to the vocabulary, processes and tools of manufacturing with hands-on experience. This course is designed to have one class of lectures followed by a class of hands-on exercises to effectively internalize the knowledge. The course teaches three main learning modules: shop floor management, quality management and supply chain management. Prerequisite: Engineering 4 or permission of instructor. (Spring)

183. MANAGEMENT OF TECHNICAL ENTERPRISE (3)
Gokli, Little, Krauss. This course provides a fundamental understanding of management practices in a technical enterprise. Instructors teach three main learning modules: financial management, people management and company management. Students will learn processes, tools, organization and measurables in all three learning modules. Prerequisite: Engineering 4 or permission of instructor. (Fall)

190. SPECIAL TOPICS IN ENGINEERING (3)
Staff. An upper division or graduate technical elective treating topics in engineering not covered in other courses, chosen at the discretion of the engineering department.

191. ADVANCED PROBLEMS IN ENGINEERING (1-3)
Staff. Independent study in a field agreed upon by student and instructor. Credit hours to be arranged.

205. SYSTEMS SIMULATION (3)
Bright. An examination of the use of high-speed digital computers to simulate the behavior of engineering and industrial systems. Both continuous and discrete systems are treated. Prerequisites: Engineering 101-102. (Fall)

206. OPTIMIZATION TECHNIQUES IN ENGINEERING DESIGN (3)
Bright. Presentation of techniques for making optimum choices among alternatives; applications to engineering design problems. Prerequisite: Engineering 205. (Spring)

231. ADVANCED TRANSPORT PHENOMENA (3)
Bright, Lape. Integrated approach to the subjects of fluid mechanics, heat transfer and mass transfer, through the study of the governing equations common to all three fields. Applications drawn from a wide variety of engineering systems. Prerequisite: Engineering 131. (Spring)

240. INTRODUCTION TO COMPRESSIBLE FLOW (3)
Cardenas. The effects of compressibility in the governing integral and differential equations for fluids. The effects of friction, heating and shock waves in steady one-dimensional flow. Unsteady

wave motion and the method of characteristics. Two-dimensional flow over air foils, linearized potential flow and the method of characteristics for supersonic flow. Prerequisite: Engineering 131. (Spring, alternate years)

278. ADVANCED STRUCTURAL DYNAMICS (3)
Cha. Free and forced response of continuous systems, including the vibration of strings, rods, shafts, membranes, beams and plates. One dimensional finite element methods: discretization of a continuum, selection of interpolation functions, and determining the element mass and stiffness matrices and the corresponding load vector. Introduction to special topics, including the effects of parameter uncertainties on the dynamics of periodic structures and model updating in structural dynamics. Prerequisite: Engineering 171. (Spring, alternate years)

HUMANITIES, SOCIAL SCIENCES, AND THE ARTS

Professors Alves (Chair), Balseiro, Barron, Beckman (emeritus), Cubek, Dadabhoy, de Laet, Dyson, Evans, Fandell, Groves, Hamilton, Kamm, Lamkin (emeritus), Mashek, Mayeri, Plascencia, Olson (emeritus), Steinberg, Sullivan, Tan and Wright.

As a liberal arts college, Harvey Mudd offers its curriculum in the spirit of providing a broadly based education. One reflection of that commitment is the College's Core, to which all academic departments contribute. Another is the program in Humanities, Social Sciences, and the Arts (HSA), which each student completes along with the Core and a major. Exposure to the subjects and methods of the various HSA disciplines builds analytical skills and offers avenues for the development of increased self-knowledge, a humane concern for society, an understanding of the wider context in which science and engineering are practiced, and an examined and evolving set of values.

The required program consists of HSA 10, Critical Inquiry—a Core course taken in the spring of the first year—along with a minimum of 10 other HSA courses. These 10 (or more) further courses must together satisfy the distribution, concentration, writing, and departmental requirements described below. A given course may be used to satisfy one or more of these requirements; e.g., the same course might count toward a student's concentration and satisfy the writing requirement. There are no prescribed courses other than HSA 10; thus, students have significant flexibility in planning their programs of study.

Distribution and concentration requirements. The distribution requirement is satisfied by taking at least one course in each of five different HSA disciplines. The concentration requirement is satisfied by taking at least four courses in a single HSA discipline or interdisciplinary field chosen from the distinct areas of liberal arts study offered at The Claremont Colleges (see the list of approved concentrations under "Advising Resources" on the HSA Department website). Together, these requirements ensure that students gain exposure to a variety of methods and perspectives within HSA, but also achieve depth and intellectual development within one area of study. Since the concentration is intended to represent progress in a field of study, even though that field might be interdisciplinary, the concentration should typically advance beyond introductory level courses. Students should work with their advisors to ensure that their concentrations include an appropriate balance of intellectual approaches to the subject. For example, advisors will generally expect that a music concentration includes at least two courses that are not performance based. A concentration in foreign languages should normally represent study of a single language and not include courses of literature in English translation. Concentrations in linguistics, ethnic studies or other interdisciplinary areas may, with the advisor's approval, include a maximum of two foreign language courses. Students who intend to concentrate in areas not covered by the department's faculty should plan their program carefully in order to be able to fulfill all requirements.

Writing requirement. So that students can build on the writing skills addressed in HSA 10, at least one HSA course taken in addition to HSA 10 must involve significant writing. Both departmental courses and HSA courses offered at the other Claremont Colleges (or outside of Claremont) can satisfy this requirement. The department's website contains a list of the departmental courses with significant writing, as well as an approval form that can be used to satisfy the writing requirement with a non-departmental HSA course. In general, a course satisfies this requirement if it assigns at least 5,000 words of formal graded writing, excluding exams, short response papers, email or online discussion contributions, and in-class writing.

Departmental requirement. The department is responsible for ensuring that exploration of the humanities, the social sciences and the arts constitutes an integral component of the life of the Harvey Mudd College community. This means that Harvey Mudd students and the department's faculty should explore these disciplines together to a significant extent. Accordingly, at least five of the courses required in addition to HSA 10 must be taken with departmental faculty. Remaining coursework (including any extra courses) may be done at the other Claremont Colleges, and the department encourages students to take advantage of this opportunity. Courses offered by departmental faculty in the Joint Music Program (Professors Cubek and Kamm) count as departmental courses. To facilitate academic and cultural experiences not available directly at Harvey Mudd, the department waives one departmental course for students who study abroad or who concentrate in an area not regularly supported by the HSA department. However, unless transferring from another institution, a student may not take fewer than four departmental courses in addition to HSA 10.

ADVISING

The department assigns each student an HSA advisor in the spring of the first year. Normally, a student's HSA 10 instructor fills this role. The student and the advisor meet at least once a semester with the approach of preregistration to review the student's progress in the program and plan future coursework. The HSA advisor can be helpful at other times also, such as when a student is considering dropping a course, encounters academic difficulties, or is thinking through choices regarding graduate school or career. Since the HSA program affords students significant choice, students are encouraged to plan ahead and keep in touch with their advisors from semester to semester. Students should also consult the department's *Advising Handbook* and the "Advising Resources" section of the department's website.

OTHER CONSIDERATIONS

In addition to the requirements outlined above, the department also encourages students to include in their HSA programs coursework that provides exposure to cultural diversity, and the department is committed to offering courses that meet this goal.

The department tries to offer a balanced mix of courses each semester. Students may also arrange for independent study by agreement with individual faculty members. Normally, an independent study course is undertaken in a discipline in which the student has already taken at least one regular course.

HUMANITIES, SOCIAL SCIENCES, AND THE ARTS COURSES

HUMANITIES, SOCIAL SCIENCES, AND THE ARTS (HSA)

10. CRITICAL INQUIRY (3)

Staff. This seminar course introduces students to inquiry, writing, and research in HSA, through focused exploration of a particular topic selected by the instructor in each section. To encourage reflection on the place of HSA within the Harvey Mudd curriculum, the course begins with a brief unit on the history and aims of liberal arts education. Writing assignments include a substantial research paper on a topic of interest chosen by the student in consultation with her or

his instructor. The course ends with student research presentations in each section, followed by a Presentations Days event featuring the best presentations from across all sections. Prerequisite: Writing 1; Writing 1E may serve as a co-requisite. (Spring)

AMERICAN STUDIES (AMST)

103. INTRODUCTION TO AMERICAN CULTURES (3)
Staff. An interdisciplinary introduction to principal themes in American culture taught by an intercollegiate faculty team.

115. PRINT AND AMERICAN CULTURE (3)
Groves. Covers numerous developments in American print culture through the careful examination of both textbooks and artifacts (period books, magazines, newspapers, letters, diaries, advertisements and so on).

120. HYPHENATED AMERICANS (3)
Balseiro. A focus on the experience of immigrants in the United States and Americans of diverse ethnic backgrounds, as reflected in literature and critical theory. The course will weave together works that treat the lives of immigrants and minority groups in the United States with examinations of such contemporary issues as bilingual education, the conditions of migrant workers, and children as cultural and linguistic interpreters for their parents. The intentionally broad and interdisciplinary nature of the course enables exploration of cultural identities, socio-economic status, and gender-specific roles.

ANTHROPOLOGY (ANTH)

110. LIFE: KNOWLEDGE, BELIEF AND CULTURAL PRACTICES (3)
de Laet. An exploration of cultural attitudes toward life and the human body: from Melanesian origin myths to the human genome project; from the first autopsies to cloning and genetic manipulation; from early body snatchings to the trade in bodies and body parts in the global economy. The question of what constitutes life is subject to controversy, and how it is answered is informed by cultural differences in practices, knowledge, and beliefs. This course aims to help students develop a sophisticated and informed attitude towards cultural difference.

111. INTRODUCTION TO THE ANTHROPOLOGY OF SCIENCE AND TECHNOLOGY (3)
de Laet. An introduction to science and technology as cultural phenomena and a hands-on initiation into anthropology. While applying basic anthropological methods in the academic environment, students gain an understanding of science and technology as a culturally, socially and historically specific way of constructing knowledge. In other words, rather than taking for granted the ways in which we make knowledge, this course renders those ways of knowledge-making "strange."

115. WAR AND CONFLICT (3)
de Laet. "The wings of the butterfly—that cause the hurricane at the other end of the earth—aren't guilty, right? … no one is." "Just the opposite," replies Faulques. "We are all a part of the monster that moves us around the chessboard." As Faulques—the painter/war-photographer protagonist in Perez-Reverte's novel *The Painter of Battles*—sees it, war and destruction and their attendant personal horrors are more ordinary, more typical of human beings than peace and civil order. But while chaos has its own rules and symmetries and nothing is coincidental or happens by chance, as spectators we are complicit in the occurrences of violent upheaval about which we read each day in *The New York Times.* We will investigate this premise. How do we explain war; what is it for? What does war do to us—distant or not-so-distant spectators—and to others—willing or unwilling participants? Is

war endemic to the human condition? Is it a necessary evil? Does it emerge from psychological and irrational "drives," or from economic, rational considerations? If we have a talent for war, do we have a talent for peace?

134. RATIONALITIES (3)
de Laet. What does it mean to be rational? Does it mean anything, to say that you are thinking rationally? This seminar takes an anthropological approach to knowledge and knowledge-making practices; it explores connections between rationality and culture. We will ask how and where, in which kinds of practices, "scientific rationality"—as we will call it for the moment—is "located." What is it about this kind of rationality that is so compelling? Are other kinds of rationalities thinkable, possible, or plausible? Are such other kinds of rationalities perhaps "at work" even as we speak, in parallel with, or embedded in, the ways in which scientists make knowledge? To answer these questions, we will examine objectivity and calculatory logic—the elements of "scientific rationality." Are objectivity and logic perhaps values as much as they are practices? We will then mine the anthropological literature for alternate logics than the ones we take for granted, examining magical thinking, belief and indigenous practices that define for "us" what is "irrational." Are such practices perhaps less irrational than we assume them to be? Finally, we will take on actual scientific practices of knowledge-making, empirically and anthropologically. We may assume that rationality as we know it imbues such practices. But are they perhaps informed by alternate logics as well? Here is where subjectivity and affect come into our picture of what scientific practices are made of; we will try to give such alternate values a place in how the bodies that "do" science act, think and make knowledge. Prerequisite: Any introductory course in anthropology or science, technology and society. Offered alternate years.

ART (ART)

33. PHOTOGRAPHY (3)

Fandell. Approaching the medium from an artistic perspective, students will explore a variety of photographic concepts and techniques. This course emphasizes seeing, thinking and creating with a critical mind and eye to provide understanding of the construction and manipulation of photographic form and meaning. The fundamentals of working with a digital single lens reflex camera (DSLR), including manual controls and lighting, are covered. Students will also explore everything from cell phone cameras, web cams and disposable cameras as equally legitimate tools for creating art. Assignments, lectures, readings and excursions will build on each other to provide students with an overview of the history and contemporary practice of photography.

60. WORKSHOP IN HAND PRESS PRINTING (1.5)
Groves. This workshop introduces students to the basic vocabulary and practices of typesetting, typography, and printing for and on an iron hand press. Work includes a skill-building project and a student-designed semester project.

171. BUILDING LOS ANGELES (3)
Groves. This course explores the complex network of urban communities in which we live in order that we might think more deeply about the relationship of the built to the natural environment. To complicate our conceptions of Los Angeles, we will consider the city's history and the massive infrastructure that allows it to function. We will focus for a substantial part of the course on architecture, which can be a profound expression of the relationship between the built and the natural. And we will explore contemporary developments, including adaptive re-use, the new urbanism and green design.

188. UNDISCIPLINED ART (3)
Fandell. Embracing the contemporary idea that art is not grounded in technique or medium but driven by concepts, this course emphasizes thinking and creating within a context of historical and theoretical concerns. Students will be challenged to re-contextualize skills they already have to address questions central to twentieth and twenty-first century art making. They will be expected to work beyond traditional labels such as painting, sculpture, photography, etc. and use unexpected processes, picking those which are best suited to their ideas and push the envelope as to what is considered art.

ART HISTORY (ARHI)

133. A HISTORY OF LANDSCAPE PHOTOGRAPHY (3)
Fandell. This course explores how photographic landscape imagery has shaped our experience and ideas of the land. Examining work dating back to the invention of the medium in 1839 to contemporary artists to NASA's Mars Rover images, we will consider how photographic imagery documents and determines the topography around us.

158. VISUALIZING CHINA (3)
Tan. Explores the political, social and cultural landscape of contemporary China through art (painting, sculpture/installation, photography, performance and videos). Theories of modern and postmodern art will be introduced in the analysis of visual materials.

CHINESE (CHIN)

1 A, B. ELEMENTARY CHINESE (3, 3)
Tan. First-year course in Chinese language. Students will engage in conversation, pattern drills, reading and character-writing. (1A is offered in fall; 1B in the spring.)

155. INTRODUCTION TO CONTEMPORARY CHINA (3)
Tan. This course examines a variety of issues in modern China, ranging from politics, the economy, and environmental problems to ethnicity, religion and the arts. We will briefly review the history of the People's Republic of China and "Greater China," but discussion will center on the 21st century. A combination of scholarly writings, literary texts, historical documents, newspaper and journal articles, personal memoirs, photographs and films will be used as course materials.

ECONOMICS (ECON)

53. PRINCIPLES OF MACROECONOMICS (3)
Evans. Provides a fundamental understanding of the national economy. Topics include theories of unemployment, growth, inflation, income distribution, consumption, savings, investment and finance markets, and the historical evolution of economic institutions and macroeconomic ideas.

54. PRINCIPLES OF MICROECONOMICS (3)
Sullivan. Provides methods of investigating the individual behavior of people, businesses and governments in a market environment. Topics include elementary models of human economic behavior and resource allocation, and the evolution of market institutions and their impact upon society.

103. THE GREAT ECONOMISTS (3)
Staff. Surveys the significant contributions of a noted economist.

104. FINANCIAL ECONOMICS (3)
Evans. The principles of money and banking from the viewpoint of both business person and banker. Topics include the operation of commercial banks, related financial institutions, the development of the banking system, international finance, governmental fiscal and monetary policy, and the relations of money and credit to prices. Prerequisite: Economics 53.

108. GOVERNMENT AND FISCAL MONETARY POLICY (3)
Evans. Includes an in-depth examination of the federal budget, deficits and the debt, budgetary enforcement, line-item spending, tax policy and theories of the impact of government economic activity upon the rest of the economy. Monetary policy emphasizes the policies and activities of the Federal Reserve System, efforts to influence interest rates, money growth and credit, and studies of policy options.

136. FINANCIAL MARKETS AND MODELING (3)
Evans. Modern financial strategy seeks to reduce market risk through the use of complex instruments called derivatives. This course introduces students to the world of futures, options and other derivatives. Topics to be covered include a survey of the markets and mathematical models of risk and volatility. Prerequisite: Economics 104 or equivalent.

140. THE ECONOMICS OF WOMEN, FAMILY AND WORK (3)
Sullivan. An introduction to research and theory in the rapidly growing field of work and family studies. Inherently interdisciplinary, the study of work/family intersections involves the literatures of sociology, anthropology, psychology, legal studies, and history, as well as economics. Topics to be considered include: the relationship between parental work and child development; the economic effects of care-giver status; gender differentials in the workplace; family-related public policy; the division of household labor, and work and health. Taught in seminar style and largely discussion-based.

142. DEVELOPMENT ECONOMICS (3)
Sullivan. A critical introduction to the major orthodox and heterodox theories of development economics and to a selection of alternative strategies. Central objectives include identification of the determinants of economic growth and the distinction of growth from development.

150. POLITICAL ECONOMY OF HIGHER EDUCATION (3)
Sullivan. An exploration of topics central to the political economy of contemporary American higher education. Organized as a seminar, the course is also a workshop in which students develop reading lists, influence the selection of subtopics and lead discussions. Likely topics include the academic labor market, admissions and marketing issues, college sports, and the role of government funding. Particular attention will be paid to forces that shape the education of scientists, mathematicians, and engineers.

153. INTERMEDIATE MACROECONOMICS (3)
Staff. A reexamination of the principles of macroeconomics at a more advanced level. The use of formal models for macroeconomic analysis and application to topical problems. Prerequisite: Economics 53. Economics 54 is recommended but not required.

154. INTERMEDIATE MICROECONOMICS (3)
Staff. An advanced treatment of micro-economic theory using formal mathematical models for analysis. Optimization models of human behavior and resource use in a market environment are developed, analyzed and applied to a topical economic allocation problem. Prerequisite: Economics 54.

HISTORY (HIST)

81. SCIENCE AND TECHNOLOGY IN THE EARLY MODERN WORLD (3)
Hamilton. We will read works of natural philosophy from the 16th and 17th centuries, including selections by Vesalius, Copernicus, Galileo, Boyle and Newton, individuals who have often been cast as crucial contributors to "The Scientific Revolution." Engaging with historians who debate the merits of this term, we will ask whether it is possible to unite these figures and the changes they represent into one coherent intellectual and social movement.

82. SCIENCE AND TECHNOLOGY IN THE MODERN WORLD (3)
Hamilton. An examination of several important episodes in the history of chemistry, biology, physics and medicine from the late 18th to mid-20th centuries. We will pay particular attention to the ways in which new scientific theories have been developed and evaluated, to the impact of cultural beliefs about gender and race on science, and to fundamental debates within science and medicine about what counts as good evidence and proper methodology.

127. TWENTIETH-CENTURY U.S. HISTORY (3)
Barron. An analysis of U.S. history from the Progressive Era to the present, with particular emphasis on social, economic and cultural developments and their relationships to political change.

128. IMMIGRATION, ETHNICITY AND RACE IN THE U. S. (3)
Barron. A study of the experiences of different ethnic groups in the U.S. from the colonial period to the present that addresses the meanings of cultural diversity in American history.

131. THE JEWISH EXPERIENCE IN AMERICA (3)
Barron. A consideration of the interactions between Jews and American society from the colonial period to the present. Topics include Anti-Semitism, American responses to the Holocaust, the United States and Israel, Black-Jewish relations, and the meanings of Jewish identity in contemporary America.

132. THE CALIFORNIA EXPERIENCE (3)
Barron. An exploration of California's history from the pre-colonial period to the present that pays special attention to the experiences of the different groups who have populated the state as well as California's environmental history and the state's changing political dynamics.

133. FOOD AND AMERICAN CULTURE (3)
Barron. This course investigates the social and cultural history of food in the United States. In many ways food is the quintessential "dense social fact," and its production and consumption embody many different layers of meaning. Consequently, one of the main goals of the course is to be able to look at food in a more critical, self-conscious, and theoretically and historically informed way-to problematize something that is so prosaic that we often take it for granted.

150. TECHNOLOGY AND MEDICINE (3)
Hamilton. This course explores the increasingly technological nature of medicine in the 19th and 20th centuries, investigating the impact of new technologies on diagnostic practices, categories of disease, doctors' professional identities and patients' understanding of their own bodies. Technologies studied include the stethoscope, electrotherapy devices, X-rays, ultrasound and MRI.

151. SCIENCE IN FICTION (3)
Hamilton. In this course, we will explore fictional texts as historical documents. Together, we will read novels from the 19th and 20th centuries in which the practice of science is central to the story being told, asking what each text reveals about cultural attitudes towards science in that time period. In addition, each student will pursue a historical research project centered on a fictional source of his or her choice.

152. A HISTORY OF MODERN PHYSICS (3)
Hamilton. An examination of the cultural and social worlds of physics in the 19th and 20th centuries. Topics include the relationship of experiment to theory, the development of relativity and quantum mechanics, the role of physicists in the atomic bomb project, and the experiences of women in physics. Prerequisite: One college-level course in physics.

LITERATURE (LIT)

103. THIRD CINEMA (3)
Balseiro. Emerging in Latin America in the 1960s and 1970s, the notion of Third Cinema takes its inspiration from the Cuban revolution and from Brazil's Cinema Novo. Third Cinema is the art of political film making and represents an alternative cinematic practice to that offered by mainstream film industries. Explores the aesthetics of film making from a revolutionary consciousness in three regions: Africa, Asia and Latin America.

104. AN INTRODUCTION TO MIDDLE ENGLISH LITERATURE (3)
Groves. For students interested in developing a basic ability to translate and pronounce Middle English. Works studied will include: the first fragment of Chaucer's "The Canterbury Tales"; "Sir Orfeo"; "Sir Gawain and the Green Knight"; and selections from Malory's "Le Morte D'Arthur."

105. THE LAND AND AMERICAN LITERATURE (3)
Groves. Explores how landscape is depicted in American literary texts and the relationship between those texts and other modes of representation (painting, cartography, photography and film).

110. SHAKESPEARE (3)
Groves. Covers selected dramatic and lyric works by Shakespeare with some attention to other Elizabethan and Jacobean writers. Final project: a public performance of a Shakespeare play.

117A. DICKENS, HARDY AND THE VICTORIAN AGE (4)
Groves, Eckert. An intensive study of the work and literary development of Charles Dickens and Thomas Hardy. Readings drawn from the authors' works and related critical, biographical, and historical texts. Class travels to England over winter break; travel expenses are the responsibility of the student. (Fall and winter break)

144. POE GOES SOUTH: THE FANTASTIC SHORT STORY (3)
Balseiro. A consideration of Poe's influence on the development of the fantastic short story in Latin America. Topics include: Poe's reception in Europe and in the Southern Cone, Poe's influence in the literature of magic realism in 20th-century Latin America.

145. THIRD-WORLD WOMEN WRITERS (3)
Balseiro. Focuses on the relationships between gender and identity in the writings of Third-World women as well as theoretical background on Third-World feminisms. Authors include Nawal El Saadawi, Alifa Rifaat, Mariama Ba, Bessie Head, Ana Lydia Vega and Jamaica Kincaid.

146. TWENTIETH-CENTURY SOUTH AFRICAN LITERATURE (3)
Balseiro. An introduction to the interactions between literature, politics and history in 20th-century South Africa. Readings include drama, poetry, fiction and biography, and viewings include several films and documentaries.

147. WRITERS FROM AFRICA AND THE CARIBBEAN (3)
Balseiro. An examination of the themes of nation, exile, race and gender in works by Chinua Achebe, Wole Soyinka, Ayi Jwei Armah, Yusuf Idriss, Ngugi wa Thiong'o, Nadine Gordimer, George Lamming, Jean Rhys and Rosario Ferre, among others. Theoretical background on Third-World literature will also be covered.

155. POST-APARTHEID NARRATIVES (3)
Balseiro. This seminar maps the literary terrain of contemporary South Africa. Through an examination of prose, poetry and visual material, this course offers some of the responses writers have given to the end of apartheid, to major social events such as the hearings of the Truth and Reconciliation Commission, and to the idea of a "new" South Africa.

MEDIA STUDIES (MS)

50. INTRODUCTION TO FILM (3)
Mayeri. Introduction to film analysis, exploring the language of film through weekly screenings and discussions. The craft of filmmaking-screenwriting, cinematography, mise-en-scene, sound, editing—from silent films, to classical Hollywood cinema, to independent film, documentary, and animation. Consideration of film as an art form, as reflection of the culture at large, and as a force for change.

60. DOCUMENTARY: FACT AND FICTION (3)
Mayeri. Examines the propaganda and poetry of documentary film. In weekly screenings, students will see films on a range of topics: from ethnographic adventures with other cultures to allegorical tales about our animal relatives. This class will explore documentary craft, history, and politics, and analyze the ethics of representing others.

62. SPECIES OF CINEMA (3)
Mayeri. This course will examine representations of animals in film—wildlife documentaries, animated features, critter cams, scientific data, and video art—to address fundamental questions about human and animal nature and culture. Animal studies is an interdisciplinary field in which scholars from philosophy, biology, media studies and literature consider the subjective lives of animals, the representations of animals in media and literature and the shifting boundary line between human and animal. In readings, screenings and discussions, we will consider the cultural and material lives of humans and animals through the lenses of science, art, literature and film.

127. THE HARMONY OF SOUND AND LIGHT (3)
Alves. New technology has created exciting new opportunities in the arts of abstract film, video and computer animation. This course will explore theories of abstraction from music into the visual arts and film, analyzing the works of such pioneers as Oskar Fischinger and John Whitney. Students will create their own computer images and animations of "visual music."

170. DIGITAL CINEMA: EXPERIMENTAL ANIMATION (3)
Mayeri. Intermediate/advanced video course, exploring the creative potential of digital video techniques, such as compositing, animation, and motion graphics. Students develop digital projects and participate in critiques. Lectures, discussions, and screenings enhance students' exposure to art and cinema. Prerequisite: Media Studies 182 Introduction to Video Production or equivalent.

173. EXILE IN CINEMA (3)
Balseiro. A thematic and formal study of the range of cinematic responses to the experience of exile. Exile is an event, but how does it come about and what are its ramifications? Exile happens to individuals but also to collectivities. How does it effect a change between the self and society, homeland and site of displacement, mother tongue and acquired language? This course examines how filmmakers take on an often painful historical process through creativity.

182. INTRODUCTION TO VIDEO ART (3)
Mayeri. Students learn how to make their own videos, using professional video cameras and editing systems. Weekly, hands-on workshops will cover the entire production process—

storyboarding, shooting, lighting, recording sound and editing in Final Cut Pro. Students will complete several group exercises and individual projects, and participate in critiques of professional media and each other's work. Video is explored as a medium for expression, persuasion, humor, storytelling and art-making. Prerequisite: Media Studies 50 at Harvey Mudd College or Media Studies 49 at other Claremont Colleges.

MUSIC (MUS)

3. FUNDAMENTALS OF MUSIC (3)
Alves, Cubek, Kamm. In this course, the student learns elementary concepts of melody, rhythm, harmony and notation. Basic principles of sight-singing and reading music are included. No previous musical experience is required. This course, or its equivalent, is a prerequisite for Music 101 (Music Theory I) at Scripps College. (Carries departmental credit when taught by Alves, Cubek or Kamm.)

48. ELECTRONIC MUSIC ENSEMBLE (1)
Alves. Rehearsal and performance of new and recent compositions for synthesizers and other instruments. Instrumentation and musical styles may vary. Though some synthesizers may be provided, in most cases students will be expected to own their own instruments. Prerequisite: ability to play an instrument and read music. Audition may be required for instructor permission.

49. AMERICAN GAMELAN ENSEMBLE (1)
Alves. Rehearsal and performance of new compositions for instruments adapted from the gamelan, a Javanese orchestra of metallophones and gongs. No prior experience on these instruments is required. Prerequisite: Ability to read music, approval of instructor.

63. MUSIC OF THE PEOPLES OF THE WORLD (3)
Alves. The fundamentals of music and listening through a survey of traditional music around the world as well as cross-cultural influences. Neither an ability to read music nor any other background in music is required.

67. FILM MUSIC (3)
Alves. An exploration of the history and aesthetics of the use of music in cinema, primarily the Hollywood film from the so-called silent era to the present. (We will not cover musicals, documentaries or short films.) The course will include the development of skills of listening analysis and writing about music in the context of narrative film. No background in music or film history is required.

81. INTRODUCTION TO MUSIC: SOUND AND MEANING (3)
Alves, Cubek, Kamm. This course explores important works of Western art music from diverse historical epochs through listening and analysis. Elements of music, basic musical terminology and notation are discussed. Attention is given to the relation of the arts—especially music—to culture and society. (Carries departmental credit when taught by Alves, Cubek, or Kamm.)

84. JAZZ IMPROVISATION (1.5)
Keller (Computer Science). The art of simultaneously hearing, composing and performing music. Chords, scales, chord progressions and tunes of modern jazz. Theory, listening, analysis and group practice in improvisation skills. Prerequisites: Music reading ability, ability to play most of the 12 major scales on an instrument, motivation to play jazz, permission of the instructor. Repeatable for credit.

88. INTRODUCTION TO COMPUTER MUSIC (3)
Alves. The basics of using software on a general purpose computer to synthesize and manipulate digital sounds. Neither a background in music nor the ability to read music is required. A background in computers is helpful but not required.

104. MUSIC SINCE 1900 (3)
Alves. An investigation of contemporary music through performances, analyses, recordings and discussions of representative compositions from late Romanticism and such 20th-century styles as Neo-classicism, Serialism and Minimalism, as well as aleatoric and electronic techniques. Prerequisite: The ability to read music. Offered in conjunction with the Joint Music Program. (Carries departmental credit when taught by Alves or Kamm.)

118. MUSIC IN THE UNITED STATES (3)
Kamm. A survey of the history and development of music in the United States, this course will examine the diverse musical cultures and traditions, including European, African, Latin American, Native American, Asian and others that have come to this country and have influenced the works of musicians and composers in the United States. Musical examples from American popular culture (jazz, rock, country and pop), from religious services and practices of various denominations and sects, from ethnic groups and folk cultures within the United States and from art music in the United States will be studied as expressions of important concerns and values in our society, and as influences on music in other countries as well. (Carries departmental credit when taught by Kamm.)

132. STRAVINSKY: HIS MILIEU AND HIS MUSIC (3)
Kamm. A seminar studying Igor Stravinsky's life and his ballets, other instrumental music and vocal music. Study of Russia at the turn of the 20th century, Paris in the early 20th century, ballet and other arts contextualizes Stravinsky's music. The course includes frequent student presentations on topics and works.

173. CONCERT CHOIR (1)
Kamm. A study through rehearsal and performance of choral music selected from the 16th century to the present, with emphasis on larger, major works. Prerequisite: successful audition. (Both semesters; joint offering of CMC, HMC, Pitzer and Scripps)

174. CHAMBER CHOIR (1)
Kamm. A study of choral music from 1300 to the present, with emphasis on those works composed for performances of a choral chamber nature. Singers in Chamber Choir also sing with the Concert Choir. Prerequisite: successful audition. (Both semesters; joint offering of CMC, HMC, Pitzer and Scripps)

175. THE CLAREMONT CONCERT ORCHESTRA (1)
Cubek. The study through rehearsal, with discussion as needed, and performance, of styles and techniques appropriate for the historically accurate performance of instrumental works intended for the orchestra. Repertoire will include works from mid-18th century to the present with special emphasis on the classical and romantic periods. Prerequisite: successful audition. (Both semesters; joint offering of CMC, HMC, Pitzer and Scripps)

PHILOSOPHY (PHIL)

108. KNOWLEDGE, SELF AND VALUE (3)
Wright. An introduction to philosophy covering representative issues in epistemology, the metaphysics of human nature and theory of value. Readings are drawn from historical and contemporary sources.

121. ETHICAL THEORY (3)
Wright. A survey of contemporary philosophical thinking about morality, concentrating on theories of normative ethics but with some attention to issues in metaethics. The course explores consequentialist, deontological, egoistic, and virtue-based normative theories, as well as debates about the impact of a commitment to morality on personal projects and relationships.

122. ETHICS: ANCIENT AND MODERN (3)
Wright. A comparative study of the works of several major moral philosophers, beginning in antiquity with Plato and Aristotle and ending in the nineteenth century with Nietzsche's critique of modern morality. Other figures studied include Hume, Kant and Mill and may also include Aquinas, Hobbes or Spinoza.

124. MORALITY AND SELF-INTEREST (3)
Wright. A study of historical and contemporary arguments for the harmony of morality and enlightened self-interest, along with some of the main challenges raised against such arguments by their critics. Reading assignments may include selections from Plato, Aristotle, Sidgwick, Prichard, Ayn Rand, Rosalind Hursthouse, Derek Parfit, David Gauthier and others.

125. ETHICAL ISSUES IN SCIENCE AND ENGINEERING (3)
Wright. After briefly exploring concepts and theories in normative ethics, this course examines a representative set of ethical issues confronting researchers and practitioners in the natural and formal sciences and in engineering. Issues covered will vary but may include animal experimentation, genetic engineering, internet privacy, the responsibility of engineers to foresee and prevent harm and others.

130. POLITICAL PHILOSOPHY (3)
Wright. The major traditions of political thought, with emphasis on the modern era, including natural rights theory, social contract theory, and the philosophic foundations of political liberalism.

POLITICAL STUDIES (POST)

114. COMPARATIVE ENVIRONMENTAL POLITICS (3)
Steinberg. An examination of the political challenges faced by environmental advocates in diverse countries around the globe. Drawing on the fields of comparative politics and public policy, topics include comparative political institutions, environmental movements, corruption, authoritarian regimes, democratization, lesson-learning across borders, policy reform, gender analysis, decentralization and European unification.

140. GLOBAL ENVIRONMENTAL POLITICS (3)
Steinberg. Analyzes the political dynamics driving global environmental problems and current attempts to address them. Concepts from political science and public policy are applied to issues such as ozone depletion, climate change, trade in endangered species, treaty formation and effectiveness, transnational activism and multi-level governance.

188. POLITICAL INNOVATION (3)
Steinberg. Under what conditions do novel political ideas become realities? This course explores the origins and impacts of political innovations large and small—from the framing of the Constitution to the development of major social policies, the creation and reform of government agencies and non-profit organizations and experimentation with new forms of social protest and political mobilization.

PSYCHOLOGY (PSYC)

53. INTRODUCTION TO PSYCHOLOGY (3)
Mashek. An introduction to the field of psychology with a special emphasis on overarching themes and methodologies employed in the discipline.

108. INTRODUCTION TO SOCIAL PSYCHOLOGY (3)
Mashek. The study of the way individuals think about, influence and relate to one another. Sample topics include: conformity, persuasion, social cognition, self-justification, prejudice and attraction.

150. PSYCHOLOGY OF CLOSE RELATIONSHIPS (3)
Mashek. An introduction to the leading theoretical perspectives employed by social psychologists in the study of close romantic relationships. Participants will examine a number of relationship-relevant constructs (e.g., love, commitment, intimacy, breakups) through the lenses offered by these different theories.

RELIGIOUS STUDIES (RLST)

105. RELIGIONS IN AMERICAN CULTURE (3)
Dyson. An exploration of American religious history from pre-colonial indigenous civilizations through the present, focusing on three related issues: diversity, toleration and pluralism. The course asks how religions have shaped or been shaped by encounters between immigrants, citizens, indigenous peoples, tourists, and, occasionally, government agents. In relation to these encounters, the course considers how groups and individuals have claimed territory, negotiated meaning, understood each other and created institutions as they met one another in the American landscape. Attention is also given to questions of power, translation and the changing definitions of religion itself.

112. ENGAGING RELIGION (3)
Dyson. This advanced-level seminar uses case studies to explore what counts as religion in a variety of contexts: media, law, academia, economics, politics, etc. How do people recognize religion? What consequences are there for recognizing or denying the legitimacy of religious practices or beliefs? How is that legitimacy judged? How is it narrated? By approaching a few cases studies from multiple perspectives, students gain insight into how the lenses used to assess religion can enable, deepen or limit understanding.

113. GOD, DARWIN, DESIGN IN AMERICA: A HISTORICAL SURVEY OF RELIGION AND SCIENCE (3)
Dyson. Course examines the relationships between science and religion in the United States from the early 19th century to the present. Starting with the Natural Theologians, who made science the "handmaid of theology" in the early Republic, we will move forward in time through the publication of Charles Darwin's *On the Origin of Species* and Andrew Dickson White's subsequent declaration of a war between science and religion, into the 20th century with the Scopes trial and the rise of Creationism, the evolutionary synthesis, and finally the recent debates over the teaching of Intelligent Design in public schools.

114. 2038: PROPHECY, APOCALYPSE (3)
Dyson. This course looks at American configurations of the End Times, including, but not limited to, the ending of the Mayan calendar in 2012, Ghost Dance religions, Y2K predictions, The Church Universal and Triumphant, Heaven's Gate, the *Left Behind* books and movies and varied interpretations of the book of Revelation in the Christian Bible. Students taking this course will become familiar with various forms of American apocalyptic thinking as well as literature from "new religious movement" or "cult" scholarship in order to explore the enduring appeal of End Time scenarios and to question what makes these scenarios persuasive to individuals at varied points in American history.

147. WORLD RELIGIONS AND TRANSNATIONAL RELIGIONS: AMERICAN AND GLOBAL MOVEMENTS (3)
Dyson. What happens to religious practices and communities when they are transplanted to new terrain? Examples include the establishment of "old world" religious enclaves in the United States, New Age adoptions of "foreign" practices, American understandings of world religions, or the exportation of American or Americanized religion to other countries through missionaries, media or returning immigrants. Considering exchange, conflict, adaptation and innovation as multi-directional, and always historically and politically informed, the course looks at several historic and contemporary instances of religious border crossings.

183. GHOSTS AND THE MACHINES (3)
Dyson. An exploration of the interrelations between occult mediumship, modern media and technology in Europe and the United States from the nineteenth-century through the present. The aim of the course is to explore how the Enlightenment and its offspring, modern technology, in their seemingly stark material and rational promises of progress, have never rid themselves fully of the paranormal and irrational. To explore the multiple relations between ghosts and the machines, topics for the course include: ghostly visions and magic lantern phatasmagoria; American spiritualism and the telegraph; phrenology and the rise of the archive; psychical research and stage magic; radio's disembodied voices; spirit photography and light therapies; psychic television; and magic on film.

SCIENCE, TECHNOLOGY AND SOCIETY (STS)

1. INTRODUCTION TO SCIENCE, TECHNOLOGY AND SOCIETY (3)
de Laet. An introduction to the interactions among science, technology and society. Examines the different concepts of rationality and the values that underlie scientific and technological endeavors as well as the centrality of value conflict in technological controversies.

114. SOCIAL AND POLITICAL ISSUES IN TECHNICAL PROJECTS (3)
de Laet. Based on case-studies and students' experiences, this seminar examines interactions between science, technology and society in practice, studying the other-than-purely-technical aspects of research or Clinic projects in which seminar participants are engaged. The seminar culminates in a major research paper that analyzes the ethical, political and/or social issues that are at stake in these projects. The seminar is open to students who are enrolled in Clinic or thesis research.

SOCIAL SCIENCES (SOSC)

140. ECONOMIC BEHAVIORS (3)
Sullivan. This course will examine a sample of human behaviors commonly seen as economic—including gift giving, pricing and work ethics—from the perspectives of a variety of disciplines outside of economics. We will be particularly interested in cultural, social and historical factors that influence human economic actions and interactions and will consider works by anthropologists, historians, sociologists, psychologists, artists, literary critics and others. This course does not require any background in economic theory and is not designed to advance students within the standard micro/macro economic sequence.

147. ENTERPRISE AND THE ENTREPRENEUR (3)
Evans. Concepts and practices applicable to working as or with the manager of an enterprise. Some emphasis on enterprise formation and on management in high-technology firms.

150. PUBLIC SPEAKING FOR SCIENCE AND CITIZENSHIP (3)
Steinberg. This course builds student speaking skills in three areas: communicating advanced topics in science and technology to non-specialists; speaking out on questions of politics and values; and engaging the intersection of the two through presentations on technically intensive social controversies.

180. TROPICAL FORESTS: POLICY AND PRACTICE (3)
Steinberg. This course takes stock of the past two decades of social science research on tropical forests, examining the scale of deforestation, its causes and consequences, and the track record of attempted solutions. Special emphasis is placed on the ways in which values, institutions and political-economic forces shape the decisions that will determine the fate of the forests.

SPECIAL TOPICS AND INDEPENDENT STUDY COURSES (VARIOUS)

179. SPECIAL TOPIC COURSES (3)
Staff. Special topics courses—one-time or occasional course offerings—are designated with the number 179. They may be offered in any discipline within the humanities, social sciences and the arts.

197-198. INDEPENDENT STUDY COURSES (1-3)
Staff. Students may arrange for independent study with individual faculty members in the humanities, social sciences and the arts, subject to their permission, in order to pursue particular interests that are not covered by regular courses. Independent study courses, designated with the number 197 (Fall) or 198 (Spring), may be taken in any discipline within the humanities, social sciences and the arts. The College limits such courses to juniors and seniors. See the discussion of "Directed Reading Courses" in the "Academic Regulations" section of this catalogue for other restrictions.

SPECIAL INTERDEPARTMENTAL AND INTERCOLLEGIATE PROGRAMS

The Department of Humanities, Social Sciences, and the Arts participates in a number of interdepartmental and intercollegiate programs that provide suitable areas for concentration and offer courses that may be of interest to Harvey Mudd students:

AFRICANA STUDIES
The Intercollegiate Department of Africana Studies offers a multidisciplinary curriculum that examines the experiences of African, African American and Caribbean people from the liberal arts perspective. Courses accommodate the needs of majors and non-majors, providing significant preparation for careers in education, social work, public policy, law, medicine, business, international relations and advanced research. Consult Professors Isabel Balseiro or Talithia Williams (mathematics).

AMERICAN STUDIES
American Studies is a multidisciplinary program that introduces students to the complexities of the American experience and encourages them to think critically about American culture. An essential component of the American Studies curriculum is Introduction to American Cultures, which is team-taught by members of the intercollegiate faculty. Consult Professors Hal Barron or Jeffrey Groves.

ASIAN-AMERICAN STUDIES
The Intercollegiate Asian American Studies Program offers an interdisciplinary approach to exploring the hitherto neglected experience of Asians in the U.S. The courses are open to all students of The Claremont Colleges, and they provide undergraduates with an understanding of the diversity and complexity of this segment of United States society. Consult Professors Hal Barron or Chang Tan.

CHICANA/O-LATINA/O STUDIES
The Chicana/o-Latina/o Studies Intercollegiate Department, the academic program of the Chicana/o-Latina/o Studies Center, offers a curriculum with a multidisciplinary approach to the study, research, interpretation and investigation of the Chicana/o-Latina/o experience. The courses are open to all students of The Claremont Colleges. In recognition of the vital presence of Chicanos and other Latinos in the West, Southwest, and increasingly the entire nation, Chicana/o-Latina/o studies provides significant preparation for students pursuing careers in education, social work, public policy, law, medicine, business and scholarly research. Consult Professor Isabel Balseiro.

ENVIRONMENTAL ANALYSIS
The Harvey Mudd Center for Environmental Studies coordinates courses and research in all departments of the College, and provides links to major ongoing programs of environmental

studies at other Claremont Colleges. A strong advising program administered by the center helps students arrange programs that take advantage of courses in their majors as well as concentrations in the humanities and social sciences program, leading to a strong emphasis in environmental studies as a part of the Harvey Mudd College degree. Consult Professor Richard Haskell (physics) and see https://www.hmc.edu/hcsed/.

MEDIA STUDIES

Harvey Mudd College participates in the Intercollegiate Media Studies (IMS) program, an intercollegiate, interdisciplinary program that investigates social histories, cultural contexts, theoretical approaches and technologies of media forms. IMS production is oriented toward "independent" narrative forms, documentary, video and digital art, and community-based and activist media. Consult Professor Rachel Mayeri.

MUSIC

In addition to its own offerings in music, Harvey Mudd College participates in the Joint Music Program with Claremont McKenna, Pitzer and Scripps colleges. Courses are offered in music history, music theory, and performance ensembles, including the Claremont Concert Orchestra and choirs. Consult Professors William Alves, David Cubek or Charles Kamm.

RELIGIOUS STUDIES

The intercollegiate program in Religious Studies recognizes the importance and legitimacy of personal involvement in the study of religion, but it does not represent or advocate any particular religion as normative. Rather, its aim is to make possible an informed knowledge and awareness of the fundamental importance of the religious dimension in all human societies—globally and historically. Consult Professor Erika Dyson.

SCIENCE, TECHNOLOGY AND SOCIETY (STS)

The STS program is designed to deepen students' understanding of both the context in which science and technology develop and the social consequences of scientific and technological change. Work in STS should not only enhance prospective scientists' and engineers' abilities to exercise influence within and on behalf of their professional communities, but also to assess the probable social impacts of their work. In addition, the program is intended to provide background for graduate work or career choices in such fields as history of science and technology, philosophy of science, public policy, law, medicine, science writing, science librarianship or secondary school science teaching. The College's interdepartmental Hixon Forum for Responsive Science and Engineering works directly and cooperatively with the Claremont STS program. Consult Professors Marianne de Laet or Vivien Hamilton.

THEATER

Theater is one of the liberal arts and serves students from the five undergraduate colleges. It includes acting, design, directing, theater history and dramatic literature, and the practice of theater. Students concentrating in theater become proficient in bringing creative solutions to complex problems. They also develop sensitivity to the interpersonal relationships inherent in the collaborative process. Thus, they are prepared for a wide variety of careers in organizations and enterprises that value these qualities. The program is housed in excellent facilities at Pomona College. Consult Professor Jeffrey Groves.

WOMEN'S STUDIES, GENDER STUDIES, AND FEMINIST STUDIES

Women's Studies at Harvey Mudd is part of an interdisciplinary and intercollegiate program that focuses on the nature and scope of women's achievement, promotes open and rigorous inquiry about women and sex roles, and questions cultural assumptions about women's place. This program also explores such areas as the relationship between gender and society historically and cross-culturally; the changing roles and concepts of women; and women's participation in major social institutions. Consult Professor Isabel Balseiro.

MATHEMATICS

(See also Joint Majors in Computer Science and Mathematics, and Mathematical and Computational Biology)

Professors de Pillis (Chair), Benjamin, Bernoff, Castro, Coleman (emeritus), Gu, Jacobsen, Karp, Krieger (emeritus), Levy, Martonosi, Omar, Orrison, Pippenger, Su, Ventura, Williams and Yong.

A mathematics degree from Harvey Mudd College will prepare students for a variety of careers in business, industry or academics. Mathematical methods are increasingly employed in fields as diverse as finance, biomedical research, management science, the computer industry and most technical and scientific disciplines. To support the academic and professional goals of our majors, we offer a wide selection of courses in both pure and applied mathematics. This selection is enhanced by courses offered in cooperation with the other Claremont Colleges, including graduate courses at the Claremont Graduate University.

Students will have many opportunities to do mathematical research with faculty through independent study, a summer research experience, or their senior capstone experience. Active areas of mathematical research at Harvey Mudd and The Claremont Colleges include algebra, algebraic geometry, algorithms and computational complexity, combinatorics, differential geometry, dynamical systems, fluid mechanics, graph theory, number theory, numerical analysis, mathematical biology, mathematics education, operations research, partial differential equations, real and complex analysis, statistical methods and analysis, and topology.

The culmination of the degree is the senior capstone research experience: every student experiences a taste of the life of a professional mathematician as part of a team in the Mathematics Clinic Program or by working individually on a Senior Thesis.

An educational innovation of Harvey Mudd, the Clinic Program brings together teams of students to work on a research problem sponsored by business, industry or government. Teams work closely with a faculty advisor and a liaison provided by the sponsoring organization to solve complex, real-world problems using mathematical and computational methods. Clinic teams present their results in bound final reports to the sponsors and give several formal presentations on the progress of the work during the academic year.

Our Senior Thesis program provides students with the opportunity to work independently on a problem of their choosing. Advisors and readers may be chosen from the Harvey Mudd faculty and the other mathematicians at The Claremont Colleges, providing students with a wealth of research opportunities. As with Clinic, the end product of a thesis is a bound volume as well as presentations made at a professional conference or other venue and during College-wide events, including Presentation Days.

The course of study for a mathematics degree has five components: The Major Core, Computational Mathematics, Clinic or Thesis, Mathematics Forum and Mathematics Colloquium and the Elective Program. Each of these components to the major program is described, below.

THE MAJOR CORE

A set of core courses is required of each mathematics major. These courses cover a range of fundamental fields of mathematics and position the student to pursue any one of a variety of elective programs to finish the degree. The Major Core consists of Mathematics 55 (Discrete Mathematics), Mathematics 70 (Intermediate Linear Algebra), Mathematics 80 (Intermediate Differential Equations), Mathematics 131 (Mathematical Analysis I), Mathematics 157 (Intermediate Probability), Mathematics 171 (Abstract Algebra I) and Mathematics 180 (Applied Analysis).

COMPUTATIONAL MATHEMATICS

Computational techniques are essential to many fields of modern mathematics and to most mathematical applications in business and industry. One course in computational mathematics is required of all mathematics majors, selected from the following list: Mathematics 164 (Scientific Computing), Mathematics 165 (Numerical Analysis), Mathematics 167 (Complexity Theory), Mathematics 168 (Algorithms), or Computer Science 81 (Computability and Logic).

CLINIC OR THESIS

Two semesters of Mathematics Clinic (Mathematics 193) or two semesters of Senior Thesis (Mathematics 197) are required and normally taken in the senior year. Clinic and thesis are important capstone experiences for each mathematics major: they represent sustained efforts to solve a complex problem from industry or mathematical research. To do a senior thesis, students must prepare a senior research proposal with the help of their thesis advisor. The proposal will describe the intended senior research project and must be submitted to the Department of Mathematics for approval before the end of the junior year. Clinic teams will be formed in the fall according to the requirements of the projects and student preferences. Students who do Clinic must work on the same Clinic project both semesters.

MATHEMATICS FORUM AND MATHEMATICS COLLOQUIUM

All mathematics majors must take one semester of Mathematics Forum (Mathematics 198) and one semester of Mathematics Colloquium (Mathematics 199), generally in the junior year. In the mathematics forum, students prepare and present talks on mathematical topics taken from the literature. As a requirement for the mathematics forum, students must submit a tentative description of their proposed elective program to the department by the end of the fall semester of the junior year.

THE ELECTIVE PROGRAM

To complete the degree, three elective mathematics courses totaling at least seven credit hours are required. The elective program will be designed by the student in consultation with her or his advisor. To assist students in designing their elective program, the department has prepared a variety of sample programs. These sample programs list courses that support a wide range of career goals in academics, business or industry. About half of our graduates immediately join the workforce and about half enter graduate school. Several sample elective programs are listed below. In each of these samples, the first two courses are strongly recommended; at least one additional course is to be selected in order to complete the elective program. We emphasize that sample elective programs are advisory. Students may follow a sample program or design one of their own.

(Numbers presume a course prefix MATH and course suffix HM unless otherwise specified. CSCI = Computer Science, ECON = Economics, CM = Claremont McKenna College, CG = Claremont Graduate University, PO = Pomona College)

Pure Mathematics: 132, 172 and at least one elective from 104, 106, 123, 136, 142, 143, 147, 173, 174, 175, 331 CG, 332 CG, 334 CG.

Applied Mathematics: 136, 181 and at least one elective from 118, 119,132, 164, 165, 173, 182, 187, 362 CG, 368 CG, 382 CG.

Probability and Statistics: 152, 156 and at least one elective from 106, 132, 152, 153, 155, 158, 173, 187, 351 CG, 355 CG.

Operations Research: 156, 187 and at least one elective from 104, 106, 132, 152, 158, 159, 165, 168, 188.

Actuarial or Financial Mathematics: 109, 156 and at least one elective from 152, 155, 158, 165, 187, 355 CG, Econometrics (ECON 125 CM, 126 CM; ECON 382 CG, 383 CG, 384 CG; ECON 167 PO).

Scientific Computing: 164, 165 and at least one elective from 118, 119, 136, 168, 173, 181, 182, CSCI 156, 362 CG, 368 CG, 382 CG.

Theoretical Computer Science: CSCI 81, 168 and at least one elective from 104, 106, 107, 123, 165, 167, 172, 175, CSCI 151, CSCI 152, CSCI 156.

Mathematical Biology: 118, 119 and at least one elective from 152, 156, 158,164, 168, 173, 181, 182,187.

ADVISING

The mathematics faculty works closely with each mathematics major to develop a coherent program of elective courses that meets the student's professional and academic goals. The department meets once each year to discuss and evaluate student programs and to discuss student progress.

FACILITIES

The Department of Mathematics and the College provide excellent computational facilities. The department's Scientific Computing Laboratory houses workstations supporting classroom activities and student and faculty research in numerical analysis, algorithms, parallel computing, and scientific computing, addressing diverse problems in mathematical modeling (such as problems in fluid mechanics and mathematical biology), operations research and statistical analysis. Additional resources include Beowulf-style distributed parallel-computing clusters and multiprocessor, large-memory, parallel compute servers. The department supports a wide variety of commercial and free/open-source mathematical software packages such as Mathematica, Maple, MATLAB, R, and SAGE.

OTHER MATHEMATICAL ACTIVITIES AT HARVEY MUDD AND IN CLAREMONT

There are many opportunities outside of coursework to enjoy and participate in mathematics. Some of these activities are described below.

The William Lowell Putnam Examination. The Putnam Exam is a national collegiate mathematics competition. More than 4,000 students from more than 500 institutions take the exam. It is a very challenging, 12-question exam lasting six hours (three hours in the morning and three in the afternoon). The problems on the exam can be solved using elementary methods so that students can take the exam every year they are at college. About 50 Harvey Mudd students take the exam each year, one of the highest participation rates in the country. The Harvey Mudd Putnam team has done very well in the competition. The Harvey Mudd team has placed in the top 10 teams five times in the last 10 years; usually, Harvey Mudd is the highest ranked undergraduate institution in the nation. The Putnam Seminar (Mathematics 93) meets weekly and is open to all students. This is a one-unit course that will help to prepare students for the competition.

Michael E. Moody Lecture Series. The Moody evening lecture series brings speakers to the College who illuminate the joy, wonder and applications of mathematics, attracting hundreds of students and other members of The Claremont Colleges community.

Weekly Mathematics Colloquium. The Claremont Colleges Mathematics Colloquium meets once per week. Most of the colloquium speakers are mathematicians from around the country who speak about their research or give talks of general mathematical interest. To encourage undergraduates to attend, all speakers are encouraged to design their talk to be accessible to undergraduate mathematics majors.

Mathematics Seminars. Several weekly seminars on special mathematical topics are offered in Claremont each year. Recent seminars include analysis, algebra, applied mathematics, combinatorics, number theory, operations research, statistics, financial mathematics and topology. Faculty, CGU graduate students and advanced undergraduate students attend the seminars.

Mathematical/Interdisciplinary Contests in Modeling (MCM/ICM). The MCM/ICM contests are sponsored by the Consortium for Mathematics and its Applications and the Society for Industrial and Applied Mathematics. Each year, the MCM/ICM contests propose challenging, open-ended problems in applied mathematics. Competing schools form teams of three students to work on the problems over a long weekend. Teams cannot consult with any person on their solution but otherwise can use any resource available to them: computers, reference literature from the library or Internet resources. Each year, Harvey Mudd has between two and eight teams competing in the MCM and ICM, out of more than 2,700 teams internationally. Harvey Mudd has earned the highest award of Outstanding more than any other institution in the competition.

Some Recent Clinic Projects

As described above, Clinic teams work together for two semesters to solve an open problem from business, industry or government. Listed below are a few examples of recent Clinic projects and the names of the sponsors.

- CareFusion: *Modeling Fluid Transport in Subcutaneous Tissue*
- Chicago Trading Company: *Building a Multi-Agent Artificial Stock Market*
- DYNAR collaboration with CGU: *Cooperative Autonomous Aquatic Vehicles: Mathematics and Robotics*
- Laserfiche: *Automated Dewarping Algorithms for Enhancing Camera-Based Document Acquisition*
- Los Alamos National Laboratories: *Mathematical and Computational Modeling of Tumor Development*
- Overture Services Inc.: *Improved Relevance Ordering for Web Search*
- Southwest Research Institute: *Application of Iterative Blind Deconvolution Algorithms*
- Space Systems/Loral: *Application of Robust Control to Spacecraft Attitude Stability*

Some Recent Senior Theses

Several students each year write a senior thesis. It is common that theses result in papers that are submitted to mathematical journals for publication. Below are titles of several recent senior theses:

- A Method for Approximating Solutions to Differential Equations via Schauder's Theorem
- Applications of q-Binomial Coefficients to Counting Problems
- Characteristics of Optimal Solutions to the Sensor Location Problem
- Group Actions and Divisors on Abstract Tropical Curves
- Markov Bases for Analysis of Partially Ranked Data
- Mathematical AIDS Epidemic Model: Preferential Anti-Retroviral Therapy Distribution in Resource Constrained Countries
- Modeling Wave Propagation in Viscoelastic Fluids
- A Multistage Incidence Estimation Model for Diseases with Differential Mortality

- A Nonlinear ODE Model of Tumor Growth and Effect of Immunotherapy and Chemotherapy Treatment in Colorectal Cancer
- Turing Pattern Dynamics for Spatio-Temporal Models with Growth and Curvature

MATHEMATICS COURSES (MATH)

(Includes mathematics courses frequently taken by HMC students at the other Claremont Colleges)

15. APPLICATION AND ART OF CALCULUS (0.5)
Davis, Karp, Omar, Williams. This course is a fun and casual problem solving experience in single variable calculus. We will help the students strengthen mathematical skills essential to excel in the Harvey Mudd Core. Students work in groups and solve calculus problems with an emphasis on applications to the sciences. Co-requisite: Mathematics 30B or Mathematics 30G. First-year students only. (Fall, first half)

30G. CALCULUS (1.5)
Benjamin, de Pillis, Karp, Levy, Orrison, Su. A comprehensive view of the theory and techniques of differential and integral calculus of a single variable; infinite series, including Taylor series and convergence tests. Focus on mathematical reasoning, rigor and proof, including continuity, limits, induction. Introduction to multivariable calculus, including partial derivatives, double and triple integrals. Prerequisites: One year of calculus at the high school level. (Fall, first half)

30B. CALCULUS (1.5)
Benjamin, de Pillis, Karp, Levy, Omar, Orrison, Su. A comprehensive view of the theory and techniques of differential and integral calculus of a single variable; infinite series, including Taylor series and convergence tests. Focus on mathematical reasoning, rigor and proof, including continuity, limits, induction. Introduction to multivariable calculus, including partial derivatives, double and triple integrals. Placement into Math 30B is by exam and assumes a more thorough background than Math 30G; it allows for a deeper study of selected topics in calculus. Prerequisites: Mastery of single-variable calculus—entry by department placement only. (Fall, first half)

35. PROBABILITY AND STATISTICS (1.5)
Benjamin, Martonosi, Omar, Orrison, Su, Williams. Sample spaces, events, axioms for probabilities; conditional probabilities and Bayes' theorem; random variables and their distributions, discrete and continuous; expected values, means and variances; covariance and correlation; law of large numbers and central limit theorem; point and interval estimation; hypothesis testing; simple linear regression; applications to analyzing real data sets. Prerequisites: Mathematics 30B or Mathematics 30G. (Fall, second half)

40. INTRODUCTION TO LINEAR ALGEBRA (1.5)
Benjamin, de Pillis, Gu, Martonosi, Omar, Orrison, Pippenger, Su, Yong. Theory and applications of linearity, including vectors, matrices, systems of linear equations, dot and cross products, determinants, linear transformations in Euclidean space, linear independence, bases, eigenvalues, eigenvectors, and diagonalization. Prerequisites: One year of calculus at the high school level. (Spring, first half)

45. INTRODUCTION TO DIFFERENTIAL EQUATIONS (1.5)
Bernoff, Castro, de Pillis, Jacobsen, Levy, Su, Yong. Modeling physical systems, first-order ordinary differential equations, existence, uniqueness, and long-term behavior of solutions; bifurcations; approximate solutions; second-order ordinary differential equations and their properties, applications; first-order systems of ordinary differential equations. Prerequisites: Mathematics 30B or Mathematics 30G. (Spring, second half)

55. DISCRETE MATHEMATICS (3)
Benjamin, Bernoff, Orrison, Pippenger. Topics include combinatorics (clever ways of counting things), number theory, and graph theory with an emphasis on creative problem solving and learning to read and write rigorous proofs. Possible applications include probability, analysis of algorithms, and cryptography. Corequisite: Mathematics 40; or permission of instructor. (Fall and Spring)

60. MULTIVARIABLE CALCULUS (1.5)
Bernoff, Castro, Gu, Karp, Levy, Omar, Orrison, Su, Yong. Linear approximations, the gradient, directional derivatives and the Jacobian; optimization and the second derivative test; higher-order derivatives and Taylor approximations; line integrals; vector fields, curl, and divergence; Green's theorem, divergence theorem and Stokes' theorem, outline of proof and applications. Prerequisites: (Mathematics 30B or Mathematics 30G) and Mathematics 40. (Fall, first half, and summer)

65. DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA II (1.5)
Bernoff, Castro, Jacobsen, Levy, Martonosi. General vector spaces and linear transformations; change of basis and similarity. Applications to linear systems of ordinary differential equations, matrix exponential; nonlinear systems of differential equations; equilibrium points and their stability. Prerequisites: Mathematics 40 and Mathematics 45; or permission of instructor. (Fall, second half, and summer)

70. INTERMEDIATE LINEAR ALGEBRA (1.5)
de Pillis, Omar, Orrison. This half course is a continuation of Math 65 and is designed to increase the depth and breadth of students' knowledge of linear algebra. Topics include: Vector spaces, linear transformations, eigenvalues, eigenvectors, inner-product spaces, spectral theorems, Jordan Canonical Form, singular value decomposition, and others as time permits. Prerequisites: Mathematics 65; or equivalent. (Spring, first half)

80. INTERMEDIATE DIFFERENTIAL EQUATIONS (1.5)
Bernoff, Castro, de Pillis, Jacobsen, Levy. This half course is a continuation of Math 65 and is designed to increase the depth and breadth of students' knowledge of differential equations. Topics include Existence and Uniqueness, Power Series and Frobenius Series Methods, Laplace Transform, and additional topics as time permits. Prerequisites: Mathematics 65; or equivalent. (Spring, second half)

92. MATHEMATICAL CONTEST IN MODELING/INTERDISCIPLINARY CONTEST IN MODELING SEMINAR (1)
Martonosi. This seminar meets one evening per week during which students solve and present solutions to challenging mathematical problems in preparation for the Mathematical Contest in Modeling (MCM) and Interdisciplinary Contest in Modeling (ICM), an international undergraduate mathematics competition. Prerequisites: none. (Fall)

93. PUTNAM SEMINAR (1)
Bernoff, Omar, Pippenger, Su. This seminar meets one evening per week during which students solve and present solutions to challenging mathematical problems in preparation for the William Lowell Putnam Mathematics Competition, a national undergraduate mathematics contest. Prerequisites: none. (Fall)

94. PROBLEM SOLVING SEMINAR (1)
Bernoff, Omar. This seminar meets one evening per week during which students solve and present solutions to problems posed in mathematics journals, such as the *American Mathematical Monthly*. Solutions are submitted to these journals for potential publication. Prerequisites: none. (Spring)

104. GRAPH THEORY (3)
Martonosi, Omar, Orrison, Pippenger. An introduction to graph theory with applications. Theory and applications of trees, matchings, graph coloring, planarity, graph algorithms, and other topics. Prerequisites: Mathematics 40 and Mathematics 55. (Alternate years)

106. COMBINATORICS (3)
Benjamin, Omar, Orrison, Pippenger. An introduction to the techniques and ideas of combinatorics, including counting methods, Stirling numbers, Catalan numbers, generating functions, Ramsey theory and partially ordered sets. Prerequisites: Mathematics 55; or permission of instructor. (Alternate years)

108. HISTORY OF MATHEMATICS (3)
Grabiner (Pitzer). A survey of the history of mathematics from antiquity to the present. Topics emphasized will include: the development of the idea of proof, the "analytic method" of algebra, the invention of the calculus, the psychology of mathematical discovery, and the interactions between mathematics and philosophy. Prerequisites: Mathematics 30B or Mathematics 30G. (Alternate years)

109. INTRODUCTION TO THE MATHEMATICS OF FINANCE (3)
Aksoy (CMC). This is a first course in Mathematical Finance sequence. This course introduces the concepts of arbitrage and risk-neutral pricing within the context of single- and multi-period financial models. Key elements of stochastic calculus such as Markov processes, martingales, filtration and stopping times will be developed within this context. Pricing by replication is studied in a multi-period binomial model. Within this model, the replicating strategies for European and American options are determined. Prerequisites: Mathematics 65; or equivalent or permission of instructor. (Alternate years)

110. APPLIED MATHEMATICS FOR ENGINEERING (1.5) (Also listed as Engineering 72)
Levy, Yong, Bassman (Engineering). Applications of differential equations, linear algebra, and probability to engineering problems in multiple disciplines. Mathematical modeling, dimensional analysis, scale, approximation, model validation, Laplace Transforms. (May not be included in a mathematics major program.) Prerequisites: Mathematics 35 and Mathematics 65; or equivalent. (Spring, first half)

115. FOURIER SERIES AND BOUNDARY VALUE PROBLEMS (3)
Bernoff, Levy, Yong. Complex variables and residue calculus; Laplace transforms; Fourier series and the Fourier transform; Partial Differential Equations including the heat equation, wave equation, and Laplace's equation; Separation of variables; Sturm-Liouville theory and orthogonal expansions; Bessel functions. (May not be included in a mathematics major program. Students may not receive credit for both Mathematics 115 and 180.) Prerequisites: Mathematics 65; or equivalent. (Spring)

119. ADVANCED MATHEMATICAL BIOLOGY (2) (Also listed as Biology 119)
de Pillis, Jacobsen, Levy, Adolph (Biology). Further study of mathematical models of biological processes, including discrete and continuous models. Examples are drawn from a variety of areas of biology, which may include physiology, systems biology, cancer biology, epidemiology, ecology, evolution, and spatiotemporal dynamics. Prerequisite: Mathematical and Computational Biology 118, or Mathematics 118; or permission of instructor.

131. MATHEMATICAL ANALYSIS I (3)
Castro, Karp, Omar, Su. This course is a rigorous analysis of the real numbers and an introduction to writing and communicating mathematics well. Topics include properties of the rational and the real number fields, the least upper bound property, induction, countable sets, metric spaces, limit points, compactness, connectedness, careful treatment of sequences and series, functions, differentiation and the mean value theorem, and an introduction to

sequences of functions. Additional topics as time permits. Prerequisites: Mathematics 55 or Mathematics 101 at Pomona or Scripps. (Jointly; Fall semester at HMC and Pomona, Spring semester at HMC and CMC)

132. MATHEMATICAL ANALYSIS II (3)
Castro, Omar, Su, Radunskaya (Pomona). A rigorous study of calculus in Euclidean spaces including multiple Riemann integrals, derivatives of transformations and the inverse function theorem. Prerequisites: Mathematics 131. (Jointly; Fall semester at HMC, Spring semester at Pomona)

136. COMPLEX VARIABLES AND INTEGRAL TRANSFORMS (3)
Gu, Jacobsen, Karp, Yong. Complex differentiation, Cauchy-Riemann equations, Cauchy integral formulas, residue theory, Taylor and Laurent expansions, conformal mapping, Fourier and Laplace transforms, inversion formulas, other integral transforms, applications to solutions of partial differential equations. Prerequisites: Mathematics 65; or equivalent. (Fall)

137. GRADUATE ANALYSIS I (3) (Also listed as Mathematics 331 at CGU)
Castro, Krieger, Grabiner (Pomona), O'Neill (CMC). Abstract Measures, Lebesgue measure, and Lebesgue-Stieltjes measures on R; Lebesgue integral and limit theorems; product measures and the Fubini theorem; additional topics. Prerequisites: Mathematics 132. (Fall)

138. GRADUATE ANALYSIS II (3) (Also listed as Mathematics 332 at CGU)
Castro, Krieger, Omar, Grabiner (Pomona), O'Neill (CMC). Banach and Hilbert spaces; Lp spaces; complex measures and the Radon-Nikodym theorem. Prerequisites: Mathematics 137 or Mathematics 331. (Spring)

142. DIFFERENTIAL GEOMETRY (3)
Gu, Karp, Bachman (Pitzer). Curves and surfaces, Gauss curvature; isometries, tensor analysis, covariant differentiation with application to physics and geometry (intended for majors in physics or mathematics). Prerequisites: Mathematics 65; or equivalent. (Fall)

143. SEMINAR IN DIFFERENTIAL GEOMETRY (3)
Gu. Selected topics in Riemannian geometry, low dimensional manifold theory, elementary Lie groups and Lie algebra, and contemporary applications in mathematics and physics. Prerequisites: Mathematics 131 and Mathematics 142; recommended Mathematics 147; or permission of instructor. (Spring)

147. TOPOLOGY (3)
Karp, Pippenger, Su, Flapan (Pomona). Topology is the study of properties of objects preserved by continuous deformations (much like geometry is the study of properties preserved by rigid motions). Hence, topology is sometimes called "rubber-sheet" geometry. This course is an introduction to point-set topology with additional topics chosen from geometric and algebraic topology. It will cover topological spaces, metric spaces, product spaces, quotient spaces, Hausdorff spaces, compactness, connectedness and path connectedness. Additional topics will be chosen from metrization theorems, fundamental groups, homotopy of maps, covering spaces, the Jordan curve theorem, classification of surfaces and simplicial homology. Prerequisites: Mathematics 131; or permission of instructor. (Jointly with Pomona; Spring semester)

148. KNOT THEORY (3)
Hoste (Pitzer). An introduction to theory of knots and links from combinatorial, algebraic, and geometric perspectives. Topics will include knot diagrams, p-colorings, Alexander, Jones, and HOMFLY polynomials, Seifert surfaces, genus, Seifert matrices, the fundamental group, representations of knot groups, covering spaces, surgery on knots, and important families of knots. Prerequisites: Mathematics 40; or permission of instructor. (Alternate years)

152. STATISTICAL THEORY (3)
Martonosi, Williams, Hardin (Pomona), Huber (CMC). An introduction to the general theory of statistical inference, including estimation of parameters, confidence intervals and tests of hypotheses. Prerequisites: Mathematics 151 or Mathematics 157; or permission of instructor. (Jointly; Spring semester at Pomona and CMC)

153. BAYESIAN STATISTICS (3)
Williams. An introduction to principles of data analysis and advanced statistical modeling using Bayesian inference. Topics include a combination of Bayesian principles and advanced methods; general, conjugate and noninformative priors, posteriors, credible intervals, Markov Chain Monte Carlo methods, and hierarchical models. The emphasis throughout is on the application of Bayesian thinking to problems in data analysis. Statistical software will be used as a tool to implement many of the techniques. Prerequisites: Mathematics 35; or permission of the instructor. (Spring, alternate years)

155. TIME SERIES (3)
Williams. An introduction to the theory of statistical time series. Topics include decomposition of time series, seasonal models, forecasting models including causal models, trend models, and smoothing models, autoregressive (AR), moving average (MA), and integrated (ARIMA) forecasting models. Time permitting we will also discuss state space models, which include Markov processes and hidden Markov processes, and derive the famous Kalman filter, which is a recursive algorithm to compute predictions. Statistical software will be used as a tool to aid calculations required for many of the techniques. Prerequisites: Mathematics 35; or permission of the instructor. (Spring, alternate years)

156. STOCHASTIC PROCESSES (3)
Benjamin, Martonosi, Huber (CMC). This course is particularly well-suited for those wanting to see how probability theory can be applied to the study of random phenomena in fields such as engineering, management science, the physical and social sciences, and operations research. Topics include conditional expectation, Markov chains, Poisson processes, and queuing theory. Additional applications chosen from such topics as reliability theory, Brownian motion, finance and asset pricing, inventory theory, dynamic programming, and simulation. Prerequisites: Mathematics 40 and (Mathematics 151 or Mathematics 157); or permission of instructor. (Jointly; Alternate Fall semester at HMC)

157. INTERMEDIATE PROBABILITY (2)
Benjamin, Martonosi, Pippenger, Su, Williams. Continuous random variables, distribution functions, joint density functions, marginal and conditional distributions, functions of random variables, conditional expectation, covariance and correlation, moment generating functions, law of large numbers, Chebyshev' theorem and central-limit theorem. (Formerly Math 151.) Prerequisites: Mathematics 35; or permission of instructor. (Fall and Spring, first half)

158. STATISTICAL LINEAR MODELS (3)
Martonosi, Williams, Hardin (Pomona). An introduction to linear regression including simple linear regression, multiple regression, variable selection, stepwise regression and analysis of residual plots and analysis of variance including one-way and two-way fixed effects ANOVA. Emphasis will be on both methods and applications to data. Statistical software will be used to analyze data. Prerequisites: Mathematics 35; or permission of instructor. (Fall, alternate years)

164. SCIENTIFIC COMPUTING (3) (Also listed as Computer Science 144)
Bernoff, de Pillis, Levy, Yong. Computational techniques applied to problems in the sciences and engineering. Modeling of physical problems, computer implementation, analysis of results; use of mathematical software; numerical methods chosen from: solutions of linear and nonlinear algebraic equations, solutions of ordinary and partial differential equations, finite elements, linear programming, optimization algorithms and fast-Fourier transforms. Prerequisites: Mathematics 65 and Computer Science 60; or permission of instructor. (Spring)

165. NUMERICAL ANALYSIS (3)
Bernoff, Castro, de Pillis, Levy, Pippenger, Yong. An introduction to the analysis and computer implementation of basic numerical techniques. Solution of linear equations, eigenvalue problems, local and global methods for non-linear equations, interpolation, approximate integration (quadrature), and numerical solutions to ordinary differential equations. Prerequisites: Mathematics 65; or equivalent or permission of instructor. (Fall)

167. COMPLEXITY THEORY (3) (Also listed as Computer Science 142)
Pippenger, Libeskind-Hadas (Computer Science), Bull (Pomona). Specific topics include finite automata, pushdown automata, Turing machines, and their corresponding languages and grammars; undecidability; complexity classes, reductions, and hierarchies. Prerequisites: Computer Science 60 and Mathematics 55. (Fall)

168. ALGORITHMS (3) (Also listed as Computer Science 140)
Pippenger, Sweedyk (Computer Science), Libeskind-Hadas (Computer Science). Algorithm design, computer implementation and analysis of efficiency. Discrete structures, sorting and searching, time and space complexity, and topics selected from algorithms for arithmetic circuits, sorting networks, parallel algorithms, computational geometry, parsing and pattern-matching. Prerequisites: Mathematics 55 and Computer Science 60 and Mathematics 131. (Fall and Spring)

171. ABSTRACT ALGEBRA I (3)
Benjamin, Karp, Omar, Orrison, Shahriari (Pomona), Sarkis (Pomona). Groups, rings, fields and additional topics. Topics in group theory include groups, subgroups, quotient groups, Lagrange's theorem, symmetry groups, and the isomorphism theorems. Topics in Ring theory include Euclidean domains, PIDs, UFDs, fields, polynomial rings, ideal theory, and the isomorphism theorems. In recent years, additional topics have included the Sylow theorems, group actions, modules, representations, and introductory category theory. Prerequisites: Mathematics 40 and Mathematics 55; or permission of instructor. (Jointly; Fall semester at HMC and CMC, Spring semester at HMC and Pomona)

172. ABSTRACT ALGEBRA II: GALOIS THEORY (3)
Karp, Omar, Orrison, Su, Shahriari (Pomona), Sarkis (Pomona). The topics covered will include polynomial rings, field extensions, classical constructions, splitting fields, algebraic closure, separability, Fundamental Theorem of Galois Theory, Galois groups of polynomials and solvability. Prerequisites: Mathematics 171. (Jointly; Spring semester at HMC and Pomona)

173. ADVANCED LINEAR ALGEBRA (3)
de Pillis, Gu, Orrison. Topics from among the following: Similarity of matrices and the Jordan form, the Cayley-Hamilton theorem, limits of sequences and series of matrices; the Perron-Frobenius theory of nonnegative matrices, estimating eigenvalues of matrices; stability of systems of linear differential equations and Lyapunov's Theorem; iterative solutions of large systems of linear algebraic equations. Prerequisites: Mathematics 131; or, permission of instructor. (Jointly in alternate years)

174. ABSTRACT ALGEBRA II: REPRESENTATION THEORY (3)
Davis, Karp, Omar, Orrison, Su. The topics covered will include group rings, characters, orthogonality relations, induced representations, applications of representation theory, and other select topics from module theory. Prerequisites: Mathematics 171. (Jointly; Spring by HMC and Pomona)

175. NUMBER THEORY (3)
Benjamin, Omar, Pippenger, Towse (Scripps). Properties of integers, congruences, Diophantine problems, quadratic reciprocity, number theoretic functions, primes. Prerequisites: Mathematics 55; or permission of instructor. (Spring; offered jointly Fall semester at Scripps)

176. ALGEBRAIC GEOMETRY (3)
Karp, Omar. Topics include affine and projective varieties, the Nullstellensatz, rational maps and morphisms, birational geometry, tangent spaces, nonsingularity and intersection theory. Additional topics may be included depending on the interest and pace of the class. Prerequisites: Mathematics 171; recommended previous courses in Analysis, Galois Theory, Differential Geometry and Topology are helpful but not required; or permission of the instructor. (Fall, alternate years)

180. INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS (3)
Bernoff, Castro, de Pillis, Jacobsen, Levy. Partial Differential Equations (PDEs) including the heat equation, wave equation, and Laplace's equation; existence and uniqueness of solutions to PDEs via the maximum principle and energy methods; method of characteristics; Fourier series; Fourier transforms and Green's functions; Separation of variables; Sturm-Liouville theory and orthogonal expansions; Bessel functions. Prerequisites: Mathematics 80 and Mathematics 131; or permission of instructor. (Fall)

181. DYNAMICAL SYSTEMS (3)
Bernoff, de Pillis, Jacobsen, Levy, Radunskaya (Pomona). Existence and uniqueness theorems for systems of differential equations, dependence on data, linear systems, fundamental matrices, asymptotic behavior of solutions, stability theory, and other selected topics, as time permits. Prerequisites: Mathematics 115 or Mathematics 180; or permission of instructor. (Jointly; Fall semester at Pomona, Spring semester at HMC in alternate years)

182. GRADUATE PARTIAL DIFFERENTIAL EQUATIONS (3)
Bernoff, Castro, Jacobsen, Levy. Advanced topics in the study of linear and nonlinear partial differential equations. Topics may include the theory of distributions; Hilbert spaces; conservation laws, characteristics and entropy methods; fixed point theory; critical point theory; the calculus of variations and numerical methods. Applications to fluid mechanics, mathematical physics, mathematical biology and related fields. Prerequisites: (Mathematics 115 and Mathematics 131) or Mathematics 180; recommended Mathematics 132. (Spring; offered in alternate years)

185. INTRODUCTION TO WAVELETS AND THEIR APPLICATIONS (2)
Staff. An introduction to the mathematical theory of wavelets, with applications to signal processing, data compression and other areas of science and engineering. Prerequisites: Mathematics 115 or Mathematics 180; or permission of instructor.

187. OPERATIONS RESEARCH (3)
Benjamin, Martonosi, Huber (CMC), Shahriari (Pomona). Linear, integer, non-linear and dynamic programming, classical optimization problems and network theory. Prerequisites: Mathematics 40 or equivalent. (Fall)

188. SOCIAL CHOICE AND DECISION MAKING (3) (Also listed as Integrative Experience 198) *Su.* Basic concepts of game theory and social choice theory, representations of games, Nash equilibria, utility theory, non-cooperative games, cooperative games, voting games, paradoxes, Arrow's impossibility theorem, Shapley value, power indices, "fair division" problems and applications. Prerequisites: Prior or concurrent enrollment in Mathematics 30 or equivalent; recommended Mathematics 55; or, permission of instructor. (Spring, alternate years)

189. SPECIAL TOPICS IN MATHEMATICS (1–3)
Staff. A course devoted to exploring topics of current interest to faculty or students. Recent topics have included: Algebraic Geometry, Algebraic Topology, Complex Dynamics, Fluid Dynamics, Games and Gambling, Mathematical Toys and Riemann Zeta Functions. Prerequisites: Varies with topics chosen.

193. MATHEMATICS CLINIC (3)
Bernoff, Castro, de Pillis, Gu, Levy, Martonosi, Williams. The Clinic Program brings together teams of students to work on a research problem sponsored by business, industry or government. Teams work closely with a faculty advisor and a liaison provided by the sponsoring organization to solve complex, real-world problems using mathematical and computational methods. Students are expected to present their work orally and to produce a final report conforming to the publication standards of a professional mathematician. Prerequisites: none. (Fall and Spring; students are expected to take the two semesters of Clinic within a single academic year)

196. INDEPENDENT STUDY (1–5)
Staff. Readings in special topics. Prerequisites: Permission of department or instructor. (Fall and Spring)

197. SENIOR THESIS (3)
Staff. Senior thesis offers the student, guided by the faculty advisor, a chance to experience a taste of the life of a professional research mathematician. The work is largely independent with guidance from the research advisor. The principal objective of the senior thesis program is to help you develop intellectually and improve your written and verbal communication skills. Students are expected to present their work orally and to produce a thesis conforming to the publication standards of a professional mathematician. Prerequisites: Permission of department. (Fall and Spring)

198. UNDERGRADUATE MATHEMATICS FORUM (1)
Castro, Jacobsen, Levy, Orrison, Yong. The goal of this course is to improve students' ability to communicate mathematics, both to a general and technical audience. Students will present material on assigned topics and have their presentations evaluated by students and faculty. This format simultaneously exposes students to a broad range of topics from modern and classical mathematics. Prerequisites: none; Required for all majors; recommended for all joint CS-math majors and mathematical biology majors, typically in the junior year. (Fall and Spring)

199. MATH COLLOQUIUM (0.5)
Benjamin, Jacobsen, Su. Students will attend weekly Claremont Math Colloquium, offered through the cooperative efforts of the mathematics faculty at The Claremont Colleges. Most of the talks discuss current research in mathematical sciences and are accessible to undergraduates. Prerequisites: none. (Fall and Spring)

PHYSICAL EDUCATION

Professors Sutton (Director), Burton, Calichman, Dowling, Goldhammer, Griffiths, Hipple, Lonzo, Reimer, Retzlaff, Sanchez, Scalmanini, Semelmacher, Settles, Sweeney, Town, Vlasich.

COURSES AND REQUIREMENTS

The Harvey Mudd College physical education (PE) requirement consists of

a) a physical fitness course taken in the first-year (a "first-year PE") and

b) a physical education elective requirement, satisfied either with two semester-long PE elective courses or one season-long participation in an approved intercollegiate or club sports team offered through the Claremont McKenna-Harvey Mudd-Scripps (CMS) PE/Athletic program.

One unit credit is awarded for each PE course, up to a maximum of 3.0 credits. PE courses taken over and above the 3-unit maximum will be recorded with zero units of credit. All Physical Education courses are graded pass/no credit.

Fitness training with an associated ROTC program or completion of a physical education course at Pomona College may also fulfill a PE elective requirement.

FIRST-YEAR PHYSICAL FITNESS COURSE

The list of courses that satisfy the first-year physical fitness requirement is published on the portal by the Harvey Mudd College registrar prior to registration each semester. Each approved course includes information about physical fitness; testing of physical strengths and weaknesses; aerobic training; development of the skills for a lifelong physical fitness program; introduction of students to the Claremont McKenna-Harvey Mudd-Scripps (CMS) PE/Athletic program, faculty, and facilities. These approved Joint PE (JP) first-year physical fitness courses are taught by CMS PE Department full-time faculty. Not all JP courses satisfy the first-year requirement. Physical education courses taken at Pomona College do not satisfy the first-year requirement. Season-long participation in an intercollegiate or club sports team approved by the CMS Athletic Department fulfills the first-year physical fitness course requirement if the season-long participation occurs in the student's first year.

ELECTIVE PHYSICAL EDUCATION COURSES

Specific sport and activity course offerings are announced prior to registration each semester.

PHYSICS

Professors Saeta (Chair), Chen, Donnelly, Eckert, Esin, Gallicchio, Gerbode, Haskell, Lynn, Lyzenga, Sahakian, Sparks and Townsend.

The physics program at Harvey Mudd College provides depth and breadth in both classical and modern physics through lecture-discussion courses, laboratories and joint student-faculty research. The program is designed to serve as a strong foundation for graduate work or employment in physics and other technical fields.

A set of core courses is required of all physics majors; in addition, a variety of elective courses enable students to select a program to suit their interests and their educational and employment objectives. Laboratory courses in both introductory and advanced physics include experience with electronics, classical and modern optics, solid-state physics, and atomic and nuclear physics. Special courses and reading courses provide the opportunity for study in advanced areas normally offered only in graduate programs.

Each student is encouraged to do individual experimental or theoretical research in an area of her or his special interest, in conjunction with a faculty member. Current student-faculty research areas include observational astronomy, astrophysics, atomic physics, biophysics, computational physics, field theory, general relativity and cosmology, geophysics, laser and high-energy-density physics, magnetism, particle physics, quantum optics, quantum theory, soft-matter physics, and solid-state physics. In some of the optional programs, physics majors may elect to do research in biology or chemistry or participate in Computer Science, Engineering, Mathematics or Physics Clinic team projects.

A physics major must satisfactorily complete the following courses: Physics 52, 54, 111, 116, 133, 134, 151, 195 (taken twice), 196 (taken twice) and Mathematics 115 or 180. In addition, a physics major must satisfactorily complete the courses in one of the sets listed below. The first set constitutes the standard program in physics, but majors with a particular interest in one of the physics-related fields may substitute that set of courses for the standard program. A final oral and written report of completed research, Clinic or independent project work is required for all physics majors. The Physics 195/196 Colloquium requirement is waived for any semester during which a student is away on a study abroad program.

STANDARD PROGRAM

Two half-courses; Physics 117, 181; and at least 3 credits of Physics 191–192.

OPTIONAL PROGRAMS

Applied Physics: Physics 117; two physics half-courses; Physics 181; and 3 credits of Physics 191-192 or an approved Clinic.

Astrophysics: Astronomy 62; Physics 117; Physics 181 or Astronomy 101; two astronomy or physics half-courses; and at least 3 credits of Physics 191–192.

Biophysics: Physics 174; Physics 181 or an approved biology laboratory; three of the following—two approved biology courses, Physics 117, Chemistry 56; and at least 3 credits of Physics 191-192 or Biology 161-162.

Chemical Physics: Chemistry 51; Physics 117; Physics 161; Chemistry 168; Physics 181 or an approved chemistry laboratory; and at least 3 credits of Physics 191–192 or Chemistry 151–152.

Education: Education 170G at Claremont Graduate University, to be taken in the junior year or earlier; 3 credits of Physics 183–184; and 9 credits of approved technical electives to add breadth. Recommended courses include Astronomy 62; Physics 166; Physics 170 or Computer Science 42 or 60; Biology 108; and Chemistry 51 or 103.

Geophysics: Physics 154 or 117; 166; 181; and at least 3 credits of Physics 191–192 and one approved geology course.

Mathematical Physics: One physics half-course; Physics 117, Physics 154 or Physics 156; two additional courses to be chosen from Physics 117, Physics 154, Physics 156 and mathematics courses numbered 100 or higher that are not included in the physics major requirements; and at least 3 credits of Physics 191–192 or Mathematics 197 or an approved Clinic. Note: Physics 170 can be substituted for Physics 133 in this option provided Physics 170 is not used to meet the physics half-course requirement.

Physics and Computers: Physics 117 or two physics half-courses; Physics 170; Computer Science 42 or 60; at least 3 credits of Physics 191–192 or an approved Clinic; two electives chosen from Mathematics 165, Engineering 155, or any computer science course numbered 70 or higher. Students planning a career or graduate studies in computer applications to problems in physics and engineering would particularly benefit from Physics 117 and Mathematics 165. Students planning graduate studies in computer science should take Computer Science 105 and additional computer science courses as time permits.

Changes in any of the above programs may be made by petition to the Department of Physics.

Most physics majors go on to graduate work in physics; in allied fields such as astronomy, biophysics, geophysics, oceanography and optics; or in applied areas such as computer science, electronics or engineering. Others undertake advanced study in medicine or law or seek immediate employment in a variety of technical fields. Students who intend to go on to graduate study are advised to include Physics 154 and/or Physics 156 and either Physics 161 or Physics 168 in their program.

PHYSICS COURSES (PHYS)

18. FUNDAMENTALS OF MECHANICS (0.5)
Saeta, staff. Problem-solving strategies and practice for students in Physics 24. (Spring)

22. PHYSICS LABORATORY (1)
Connolly, staff. This course emphasizes the evidence-based approach to understanding the physical world; students design, conduct, and interpret experiments to give quantitative answers to physical questions. Topics are drawn from a broad range of physics subjects, with applications to other technical fields. (Fall and Spring)

23. SPECIAL RELATIVITY (1.5)
Saeta, Townsend, staff. Einstein's special theory of relativity is developed from the premises that the laws of physics are the same in all inertial frames and that the speed of light is a constant. The relationship between mass and energy is explored and relativistic collisions analyzed. The families of elementary particles are described and the equivalence principle developed. (Fall)

24. MECHANICS AND WAVE MOTION (3)
Saeta, staff. Classical mechanics is introduced beginning with inertial frames and the Galilean transformation, followed by momentum and momentum conservation in collisions, Newton's laws of motion, spring forces, gravitational forces and friction. Differential and integral calculus are used extensively throughout. Work, kinetic energy and potential energy are defined, and energy conservation is discussed in particle motion and collisions. Rotational motion is treated, including angular momentum, torque, cross-products and statics. Other topics include rotating frames, pseudoforces and central-force motion. Simple harmonic and some nonlinear oscillations are discussed, followed by waves on strings, sound and other types of waves, and wave phenomena such as standing waves, beats, two-slit interference, resonance and the Doppler effect. (Spring)

31. WHAT'S THE MATTER? (3)
Sparks. Students in this course will examine ordinary objects and discuss what aspects of their composition determine their usefulness. The class will discuss how materials are described, classified, and tested, and look at them from the perspectives of physics, chemistry, materials science, geology, economics, and psychology.

32. GRAVITATION (3)
Lyzenga. The theory and applications of Newtonian gravitation and an introduction to the ideas of gravitation in general relativity. Topics covered include gravitational potentials, orbits and celestial mechanics, tidal forces, atmospheres, Einstein's equivalence principle, black holes and cosmology. The target audience is students with a strong interest in fundamental physics and the mathematical as well as conceptual underpinnings of gravity and its applications. Corequisite: Physics 24 or equivalent.

51. ELECTROMAGNETIC THEORY AND OPTICS (3)
Lynn, Townsend, staff. An introduction to electricity and magnetism leading to Maxwell's electromagnetic equations in differential and integral form. Selected topics in classical and quantum optics. Prerequisites: Physics 23-24 and Mathematics 60, or concurrently. (Fall)

52. QUANTUM PHYSICS (3)
Townsend, staff. The development and formulation of quantum mechanics, and the application of quantum mechanics to topics in atomic, solid state, nuclear and particle physics. Prerequisites: Physics 51 and Mathematics 65. (Spring)

54. MODERN PHYSICS LABORATORY (1)
Eckert, staff. Classical experiments of modern physics, including thermal radiation and Rutherford scattering. Nuclear physics experiments, including alpha, beta and gamma absorption, and gamma spectra by pulse height analysis. Analysis of the buildup and decay of radioactive nuclei. Prerequisites: Physics 22, Physics 52 or concurrently. (Spring)

80. TOPICS IN PHYSICS (3)
Lyzenga, Saeta. An area of physics is studied, together with its applications and social impact. Possible areas include energy and the environment, climate change, and sustainability. Active participation and group activities are stressed. Prerequisite: Physics 51.

111. THEORETICAL MECHANICS (3)
Donnelly. The application of mathematical methods to the study of particles and of systems of particles; Newton, Lagrange and Hamilton equations of motion; conservation theorems; central force motion, collisions, damped oscillators, rigid body dynamics, systems with constraints, variational methods. Prerequisites: Physics 23-24 and Mathematics 65 or permission of the instructor. (Fall)

116. QUANTUM MECHANICS (3)
Staff. The elements of nonrelativistic quantum mechanics. Topics include the general formalism, one-dimensional and three-dimensional problems, angular momentum states, perturbation theory and identical particles. Applications to atomic and nuclear systems. Prerequisites: Physics 52. (Spring)

117. STATISTICAL MECHANICS AND THERMODYNAMICS (3)
Saeta. Classical and quantum statistical mechanics, including their connection with thermodynamics. Kinetic theory of gases. Applications of these concepts to various physical systems. Prerequisite: Physics 52; Corequisite: Physics 111 or permission of instructor.

133. ELECTRONICS LABORATORY (1)
Chen, Lyzenga, Sparks. An intermediate laboratory in electronics involving the construction and analysis of rectifiers, filters, transistor and operational amplifier circuits. Prerequisite: Physics 54. (Fall)

134. OPTICS LABORATORY (2)
Haskell. A laboratory-lecture course on the techniques and theory of classical and modern optics. Topics of study include diffraction, interferometry, Fourier transform spectroscopy, grating spectroscopy, lasers, quantum mechanics and quantum optics, coherence of waves and least-squares fitting of data. Prerequisites: Physics 51, 54. (Spring)

151. ELECTROMAGNETIC FIELDS (3)
Gerbode. The theory of static and dynamic electromagnetic fields. Topics include multipole fields, Laplace's equation, the propagation of electromagnetic waves, radiation phenomena and the interaction of the electromagnetic field with matter. Prerequisites: Physics 111 or 116 and Mathematics 115. (Fall)

154. FIELDS AND WAVES (3)
Lyzenga. The theory of deformable media. Field equations for elastic and fluid media and for conducting fluids in electromagnetic fields. Particular emphasis on body and surface wave solutions of the field equations. Prerequisite: Mathematics 115. (Spring)

156. FOUNDATIONS OF FIELD THEORY (3)
Sahakian. This course explores concepts, methods and applications of the classical theory of fields. On the physics side, we will learn about cosmological inflation, superconductivity, electroweak theory, solitons, the nuclear force and magnetic monopoles. On the mathematics side, we will learn the basics of differential geometry and Lie algebras. Throughout the course, we will emphasize the unity of physical principles and techniques across a wide range of systems and disciplines. Prerequisites: Physics 111 and Mathematics 115. (Spring)

161. TOPICS IN QUANTUM THEORY (2)
Gallicchio. Scattering, including the Born approximation and partial wave expansion. Path integrals. Time-dependent perturbation theory. Quantum theory of the electromagnetic field. Prerequisite: Physics 116. (Fall)

162. SOLID STATE PHYSICS (2)
Sparks. Selected topics in solid-state physics, including lattice structure, lattice excitations, and the motion and excitations of electrons in metals. Prerequisite: Physics 117 or equivalent. (Spring)

164. PARTICLE PHYSICS (2)
Townsend. Topics in high-energy physics including the fundamental interactions, space-time symmetries, isospin, SU(3) and the quark model and the Standard Model. Prerequisite: Physics 116. (Spring)

166. GEOPHYSICS (2)
Lyzenga. Special topics in geophysical methods and their application to construction of earth models. Prerequisite: Physics 23–24. (Spring)

168. ELECTRODYNAMICS (2)
Eckert. Selected topics in electrodynamics including wave propagation in material media. Prerequisite: Physics 151. (Spring.)

170. COMPUTATIONAL METHODS IN PHYSICS (2)
Staff. Typical numerical methods for solving a wide range of problems of current interest in physics. Examples are drawn from mechanics, electromagnetism, quantum mechanics, statistical mechanics, solid state and chemical physics. Prerequisites: Physics 52 and the ability to program. (Spring)

172. GENERAL RELATIVITY AND COSMOLOGY (2)
Sahakian. The principle of equivalence, Riemannian geometry, and the Schwarzschild and cosmological solutions of the field equations. Prerequisite: Physics 111 or permission of instructor. (Spring)

174. BIOPHYSICS (2) (Also cross-listed as Biology 174)
Gerbode. Selected topics in biolocomotion focusing on active research in the field. Possible topics include: bacteria motility, insect flight, water-walking, plant motions and slithering. Seminar format emphasizing oral presentations and group discussion. Prerequisites: Biology 52, Physics 51. (Spring)

178. SPECIAL TOPICS IN PHYSICS (1–2)
Staff. The study of an area in physics not covered in other courses, chosen each year at the discretion of the Department of Physics. Prerequisites: Depend upon the topic offered.

178A. MATERIALS SCIENCE FOR ENERGY CONVERSION AND STORAGE (2)
Van Ryswyk, Haskell, Saeta. A seminar course focusing on recent developments in the chemistry, physics and engineering of photovoltaics, fuel cells and batteries. (Fall)

181. ADVANCED LABORATORY (2)
Lynn. Experiments are selected from the fields of nuclear and solid-state physics, biophysics, quantum mechanics and quantum optics, and atomic, molecular and optical physics. Fast-time coincidence instrumentation and photon-counting detectors are employed, as well as an X-ray machine and a UV/VIS/ NIR spectrophotometer. Prerequisite: Physics 134. (Fall)

183, 184. TEACHING INTERNSHIP (3)
Saeta. An Introduction to K–12 classroom teaching and curriculum development. Internship includes supervision by an appropriate K–12 teacher and a member of the physics department and should result in a report of a laboratory experiment, teaching module, or other education innovation or investigation. Internship includes a minimum of three hours per week of classroom participation. Prerequisite: Education 170G at Claremont Graduate University, or corequisite by permission of instructor. (Fall and Spring)

191, 192. RESEARCH (1–3)
Staff. Original experimental or theoretical investigations in physics undertaken in consultation with a faculty member. Projects may be initiated by the student or by a faculty member. Present faculty research areas include astronomy, atomic and nuclear physics, optics, solid-state and low-temperature physics, general relativity, quantum mechanics, particle physics, geophysics and biophysics. (Fall and Spring)

193, 194. PHYSICS CLINIC (3)
Eckert, Haskell, Lyzenga. Team projects in applied physics, with corporate affiliation. Prerequisite: Upper-division standing. (Fall and Spring)

195, 196. PHYSICS COLLOQUIUM (0.5)
Gerbode. Oral presentations and discussions of selected topics, including recent developments. Participants include physics majors, faculty members and visiting speakers. Required for all junior and senior physics majors. No more than 2.0 credits of credit can be earned for colloquium. Pass/No Credit grading. (Fall and Spring)

197, 198. READINGS IN PHYSICS (1–3)
Staff. Directed reading in selected topics. Open to seniors only. 1–3 credit hours per semester. (Fall and Spring)

ASTRONOMY (ASTR)

21. STARS, PLANETS, AND LIFE: INTRODUCTION TO ASTROBIOLOGY (3)
Esin, Lyzenga. Interdisciplinary seminar on origin of life on Earth and possibility for life elsewhere in the universe. Emphasizes individualized and group research and learning. Topics include the creation of the universe and cosmology, the evolution of galaxies and stars, the interstellar medium and the formation of solar systems, the origin and evolution of life on Earth, and the search for extrasolar planets and extraterrestrial life and intelligence.

62. INTRODUCTION TO ASTROPHYSICS (3)
Lyzenga. A general survey of modern astrophysics. Topics covered include electromagnetic radiation, gravitation, stellar structure and evolution, the interstellar medium and the birth of stars, supernovae and the death of stars (including the physics of neutron stars and black holes), synthesis of the elements, and the formation, structure and evolution of galaxies and of the universe. Offered jointly with Pomona and Keck Sciences. Prerequisite: Physics 51 or equivalent. (Spring)

101. OBSERVATIONAL ASTRONOMY (3)
Staff. Complete survey of the techniques of observational astronomy, including optical, infrared, radio and X-ray astronomy. Four to six observational projects, including observations using The Claremont Colleges Table Mountain Observatory, plus computer projects analyzing radio and infrared data. Observational techniques used include CCD photometry, stellar spectroscopy, radio interferometry and analysis of infrared satellite data. In addition to observational techniques, the course will also cover the physics of basic emission mechanisms at the various wavelengths. Offered jointly with Pomona and Keck Sciences. Prerequisite: Astronomy 62 or permission of the instructor. (Fall)

120. STAR FORMATION AND THE INTERSTELLAR MEDIUM (2)
Staff. A survey of formation of stars and planets in the universe, the galactic interstellar medium, and the theoretical and observational aspects of understanding the physical state of matter in the galaxy. Topics include formation and detection of extrasolar planets and protostars, radio and infrared diagnostics of star forming regions and interstellar clouds, optical emission and absorption-line studies of the interstellar medium, and the role of supernovae in evolution of the interstellar medium and star formation. Offered jointly with Pomona and Keck Sciences. Prerequisites: Astronomy 62, Physics 52 or equivalent. (Offered alternate years; Spring)

121. COSMOLOGY AND EXTRAGALACTIC ASTROPHYSICS (2)
Staff. Examines the large-scale structures of the universe and the evolution of the universe from the Big Bang to the present epoch. Topics include alternate cosmologies, dark matter, cosmic background radiation, and formation and evolution of galaxies and clusters of galaxies. Offered jointly with Pomona and Keck Sciences. Prerequisites: Astronomy 62, Physics 52 or equivalent. (Offered alternate years; Spring)

122. HIGH ENERGY ASTROPHYSICS (2)
Esin. A survey of the physical processes and astrophysical systems that produce high-energy photons and presents a survey of the new ultraviolet, X-ray and gamma-ray observations. Topics include active galactic nuclei, black holes, neutron stars, supernova remnants and cosmic rays. Offered jointly with Pomona and Keck Sciences. Prerequisites: Astronomy 62, Physics 52 or equivalent. (Offered alternate years; Spring)

123. STELLAR STRUCTURE AND EVOLUTION (2)
Staff. A rigorous treatment of stellar atmospheres and radiative transfer. Topics include spectral line formation, stellar energy generation, evolution on and away from the main sequence, and the internal structures of stars and other self-gravitating objects. Offered jointly with Pomona and Keck Sciences. Prerequisites: Astronomy 62, Physics 52 or equivalent. (Offered alternate years; Spring)

124. PLANETARY ASTROPHYSICS (2)
Staff. The physics and chemistry of the planets, their natural satellites and the small bodies of the solar system. Topics include evolution and dynamics of planetary atmospheres; planetary interiors, alteration processes on planetary surfaces; the formation and dynamics of the solar system, evolution of small bodies and extra-solar systems. Offered jointly with Pomona and Keck Sciences. Half-course. Prerequisites: Astronomy 62. (Offered alternate years; Spring)

125. GALACTIC ASTRONOMY (2)
Staff. A detailed phenomenological investigation of galaxy structure, formation and evolution. We will explore galaxies as both aggregate stellar populations and signposts of cosmic evolution. The course will have a special focus on recent advances in the field. Offered jointly with Pomona and Keck Sciences. Half-course. Prerequisite: Astronomy 62.

INTERDISCIPLINARY PROGRAMS

Students cannot be awarded a double major in a joint major and one of its component majors.

JOINT MAJOR IN CHEMISTRY AND BIOLOGY

The disciplines of biology and chemistry are undergoing remarkable and converging transformations. In response to these new developments, Harvey Mudd College has established a unique opportunity for undergraduate students at the interface of biology and chemistry.

The goal is to enable students to think at the interface, to effortlessly move back and forth between chemistry and biology. They will have the background to appreciate the biological context of their research questions and they will have mastered the chemistry fundamentals that underlie the properties and reactions of biomolecules. These successful students will be able to make connections and have insights that are difficult to obtain without a thorough training in both chemistry and biology. The program in chemistry and biology will capture the imaginations of talented Harvey Mudd students and reinforce their abilities to think across disciplines.

Many schools have used the terms "biochemistry" or "biological chemistry" and some of the newer programs call themselves "chemical biology." But since the boundaries between chemistry and biology as separate disciplines are rapidly dissolving, and students can choose to steer their studies in many directions, we chose to call it simply the "Joint Major in Chemistry and Biology."

The Joint Major:
Chemistry 51. **PHYSICAL CHEMISTRY**
Chemistry 53. **PHYSICAL CHEMISTRY LABORATORY**
Chemistry 56. **CARBON COMPOUNDS**
Chemistry 58. **CARBON COMPOUNDS LABORATORY**
Chemistry 105. **ORGANIC CHEMISTRY**
Chemistry 111. **ORGANIC CHEMISTRY LABORATORY**
Biology 54. **BIOLOGY LABORATORY**
Biology 154. **BIOSTATISTICS**
Biology 111. **MOLECULAR BIOLOGY LABORATORY**
Biology 113. **MOLECULAR GENETICS**
Biology/Chemistry 182. **CHEMISTRY IN LIVING SYSTEMS**
Biology/Chemistry 184. **METHODS IN BIOCHEMISTRY**
Biology/Chemistry 189. **TOPICS IN BIOCHEMISTRY AND MOLECULAR BIOLOGY**

One pair of courses selected from:
Chemistry 103: **CHEMICAL ANALYSIS /** Chemistry 109: **CHEMICAL ANALYSIS LABORATORY**
Chemistry 104: **INORGANIC CHEMISTRY /** Chemistry 110: **INORGANIC CHEMISTRY LABORATORY**

One course selected from:
Biology 101. **COMPARATIVE PHYSIOLOGY**
Biology 108. **ECOLOGY AND ENVIRONMENTAL BIOLOGY**
Biology 109. **EVOLUTIONARY BIOLOGY**

Three elective credits of upper level Biology courses, to be selected by the student in consultation with her or his advisor.

Two successive semesters of Biology 191–192 (Biology Colloquium) and Chemistry 199 (Chemistry Seminar), four semesters total. Joint chemistry and biology majors who study abroad may waive one semester of either Biology 191/192 or Chemistry 199. The student must request the waiver from the relevant department chair, and the waiver must be communicated by the department chair to the registrar.

Two semesters (at least 6 credits total) of Senior Thesis Research (Biology 193–194, or Biology 195-196, or Chemistry 151–152). The senior thesis will have two readers, a mentor from one department and a co-reader from the other department.

NOTE: In order to optimize their opportunities and to enable individual flexibility, students may request to count other courses not currently listed as biology electives. These other courses might include new biology courses developed at Harvey Mudd, cross-listed Harvey Mudd courses (e.g., topics in biological engineering), and appropriate courses offered by other Claremont Colleges. Prior approval, granted by the chairs of biology and chemistry, will be required to substitute electives.

JOINT MAJOR IN COMPUTER SCIENCE AND MATHEMATICS

The Joint Major in Computer Science and Mathematics is cooperatively administered by the Computer Science and Mathematics departments, and students will have faculty advisors from both departments. The purpose of the joint major is to provide a program of study tailored to students who are interested in the interdisciplinary connections between computer science and mathematics. Depending on how electives are selected, the program described below would position successful majors for graduate studies in either computer science or mathematics or for immediate employment.

The Joint Computer Science and Mathematics degree program has various components: the kernel courses in computer science and mathematics; more advanced courses in computer science and in mathematics; Clinic; and electives. Each of these components is described as follows.

Four kernel courses in computer science and mathematics:

Mathematics 55. **DISCRETE MATHEMATICS**
Computer Science 60. **PRINCIPLES OF COMPUTER SCIENCE** or
Computer Science 42. **PRINCIPLES AND PRACTICES OF COMPUTER SCIENCE**
Computer Science 81. **COMPUTABILITY AND LOGIC**
Mathematics 168 / Computer Science 140. **ALGORITHMS**

Three computer science courses:

Computer Science 70. **DATA STRUCTURES AND PROGRAM DEVELOPMENT**
Computer Science 105. **COMPUTER SYSTEMS**
Computer Science 131. **PROGRAMMING LANGUAGES**

Three mathematics courses:

Mathematics 131. **ANALYSIS I**
Mathematics 165. **NUMERICAL ANALYSIS** or Mathematics 164: **SCIENTIFIC COMPUTING**
Mathematics 171. **ABSTRACT ALGEBRA I**

Clinic

Two semesters are required, ordinarily taken during the senior year. Joint majors will work on a Clinic project from either mathematics, computer science, joint computer science and mathematics, or on an interdisciplinary project. Software Development, Computer Science 121, is strongly recommended for students wishing to take Computer Science Clinic.

CSMT 183, 184. COMPUTER SCIENCE AND MATHEMATICS CLINIC I, II (3)
Staff. Team project in joint computer science and mathematics, with corporate affiliation. Prerequisite: Computer Science 121. (Fall and Spring; 183 and 184 must be taken consecutively to count toward the major.)

Electives
Eight credits of upper-division technical electives: these electives can be from mathematics, computer science or other departments (but must include at least two credits of mathematics and at least two credits of computer science) and must be chosen with approval of the faculty advisors so that a coherent program is formed. Two semesters of senior thesis research can count toward this requirement. Courses that are cross-listed between computer science and mathematics, such as Complexity Theory, which appears as both Mathematics 167 and Computer Science 142, can be taken under either course number.

Colloquia
Students are required to register for and attend two semesters of Computer Science Colloquium (Computer Science 195), one semester of Mathematics Colloquium (Mathematics 199) and one semester of Mathematics Forum (Mathematics 198). Mathematics Forum should be taken in the junior year. Colloquia should be taken in the junior or senior year.

MATHEMATICAL AND COMPUTATIONAL BIOLOGY MAJOR

Mathematical and computational methods are vital to many areas of contemporary biological research, such as genomics, molecular modeling, structural biology, ecology, evolutionary biology, neurobiology, and systems biology. Conversely, biology is providing new challenges that can drive the development of novel mathematical and computational methods.

Harvey Mudd students interested in the interface between biology, mathematics and computer science may pursue the Mathematical and Computational Biology Major, which is jointly administered by the biology, mathematics and computer science departments.

This major prepares students for graduate studies in areas including applied mathematics, bioinformatics, computational biology, genome science, mathematical biology and diverse areas of biology, as well as employment in industry.

Harvey Mudd's Core curriculum provides mathematical and computational biology majors with a strong multidisciplinary foundation, and the College offers many opportunities for students to engage in interdisciplinary research in biomathematics, computational biology and quantitative biology.

Students who choose this major become immersed in the scientific and intellectual cultures of biology, computer science and mathematics, and the major is sufficiently flexible to allow students to concentrate in a particular area of interest. Students in this major have one advisor from the biology department and one advisor from either the mathematics or computer science departments. The advisors will jointly help the student plan a program tailored to the student's interests and goals.

Requirements for the Degree
Introductory Sequence
Mathematics 55. **DISCRETE MATHEMATICS**
Biology 54. **BIOLOGY LABORATORY**
Biology 154. **BIOSTATISTICS**
MCBI 118A. **INTRODUCTION TO MATHEMATICAL BIOLOGY**
MCBI 118B. **INTRODUCTION TO COMPUTATIONAL BIOLOGY**

Biology Foundations

Any two of the following:

Biology 101. **COMPARATIVE PHYSIOLOGY**
Biology 108. **ECOLOGY AND ENVIRONMENTAL BIOLOGY**
Biology 109. **EVOLUTIONARY BIOLOGY**
Biology 113. **MOLECULAR GENETICS**

One biology seminar

One biology laboratory

Mathematical and Computation Courses

One of

Biology/Mathematics 119. **ADVANCED MATHEMATICAL BIOLOGY**
Biology 188. **ADVANCED COMPUTATIONAL BIOLOGY**

One 3-credit mathematics course chosen with the advisor. Suggested mathematics course options include (but are not limited to)

Mathematics 152. **STATISTICAL THEORY**
Mathematics 156. **STOCHASTIC PROCESSES**
Mathematics 158. **STATISTICAL DATA ANALYSIS**
Mathematics 164. **SCIENTIFIC COMPUTING**
Mathematics 168. **ALGORITHMS**
Mathematics 173. **ADVANCED LINEAR ALGEBRA**
Mathematics 180. **INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS**
Mathematics 187. **OPERATIONS RESEARCH**

One 3-credit computer science course chosen with the advisor. Suggested computer science course options include (but are not limited to)

Computer Science 60. **PRINCIPLES OF COMPUTER SCIENCE**
Computer Science 70. **DATA STRUCTURES AND PROGRAM DEVELOPMENT**
Computer Science 81. **COMPUTABILITY AND LOGIC**
Computer Science 121. **SOFTWARE DEVELOPMENT**
Computer Science 140. **ALGORITHMS**
Computer Science 133. **DATABASES**
Computer Science 144. **SCIENTIFIC COMPUTING**
Computer Science 151. **ARTIFICIAL INTELLIGENCE**
Computer Science 152. **NEURAL NETWORKS**
Computer Science 155. **COMPUTER GRAPHICS**

Five credits of additional coursework in mathematics or computer science

Electives, Thesis and Colloquium

One technical elective chosen with the advisor (3 credits)

Any course related to the student's interests in the major. Possible courses satisfying this requirement could be in biology, computer science or mathematics or in another field including (but not limited to), chemistry, bioengineering, cognitive science, neuroscience, biophysics or linguistics.

Two semesters of senior thesis or Clinic, selected in consultation with the student's academic advisors (6 credits)

Colloquium and Forum

Biology 191 & 192. **BIOLOGY COLLOQUIUM** (0.5 credits each)

Mathematics 198. **UNDERGRADUATE MATHEMATICS FORUM** (1 credit) Preferably taken in the junior year.

One semester of MCBI 199. **JOINT COLLOQUIUM FOR THE MATHEMATICAL AND COMPUTATIONAL BIOLOGY MAJOR** (0.5 credits)

Mathematical and Computational Biology Courses (MCBI)

117. GAME THEORY AND THE EVOLUTION OF COOPERATION (3)
Donaldson-Matasci (Biology). An introduction to game theory, a branch of mathematics that studies strategic interactions between individuals, with applications in fields such as biology, economics and political science. The course will introduce classical game theory, representations of games and Nash equilibria. The second part of the course will focus on evolutionary game theory, equilibrium concepts and the evolution of cooperation. Prerequisites: Mathematics 35 or AP Statistics, or permission of instructor. (Fall)

118A. INTRODUCTION TO MATHEMATICAL BIOLOGY (1.5)
Adolph (Biology), de Pillis (Mathematics), Jacobsen (Mathematics), Levy (Mathematics). An introduction to the field of mathematical biology. Continuous and discrete mathematical models of biological processes and their analytical and computational solutions. Examples may include models in epidemiology, ecology, cancer biology, systems biology, molecular evolution and phylogenetics. Prerequisites: Mathematics 65 and Biology 52; or permission of instructor. (Spring)

118B.INTRODUCTION TO COMPUTATIONAL BIOLOGY (1.5)
Bush (Biology), Donaldson-Matasci (Biology), Libeskind-Hadas (Computer Science). An introduction to the field of computational biology. Algorithms for phylogenetic inference and computational methods for solving problems in molecular evolution and population genetics. Prerequisites: Computer Science 5 and Biology 52; or permission of instructor. (Spring)

199. JOINT COLLOQUIUM FOR THE MATHEMATICAL AND COMPUTATIONAL BIOLOGY MAJOR (0.5)
Staff. Students registered for joint colloquium must attend a fixed number of colloquium talks during the semester in any field(s) related to their interests. The talks may be at any members of The Claremont Colleges or a nearby university and may be in any of a wide array of fields including biology, mathematics, computer science and other science and engineering disciplines including bioengineering, cognitive science, neuroscience, biophysics and linguistics. Students enrolled in the joint colloquium are required to submit a short synopsis of each talk that they attend. Pass/No Credit grading. (Fall and Spring)

INTEGRATIVE EXPERIENCE

The founders of the College held that "technology divorced from humanity is worse than no technology at all." IE courses may be offered by any academic department, and they are frequently team-taught.

INTEGRATIVE EXPERIENCE (IE) COURSES

142. SEMINAR IN MATHEMATICS AND SCIENCE EDUCATION (3)
Levy and Yong (Mathematics), Dodds (Computer Science). Students will learn about and contribute to math and science education in our community. Over the course of the semester, students observe math and science classrooms and reach out to integrate with our readings and discussions, which will be centered around questions such as: "What is effective math and science teaching?" "What is effective math and science education?" "How does math and science education impact our society?" Prerequisites: none. (Fall or Spring)

144. MATHEMATICS, MUSIC, ART: COSMIC HARMONY (3)
Orrison (Mathematics), Alves (Humanities, Social Sciences, and the Arts). A seminar exploring some of the many intersections between mathematics and music within our own and non-Western cultures, including proportion in art, tuning systems, algorithmic composition, artificial intelligence and creativity and music synthesis. The class will also examine the ethical, aesthetic and cultural ramifications of compression technology, sampling, downloading and the effects of technology on music and vice versa. Prerequisites: none. (Fall or Spring)

179. SPECIAL TOPICS (3)
Staff. Course will consider issues of current importance to society.

OTHER PROGRAMS

INDIVIDUAL PROGRAM OF STUDIES

Some students find that concentration in one of the majors offered at Harvey Mudd does not meet their educational goals. As an alternative, any student may devise an individual program of studies (IPS) designed to serve her or his academic interests. An IPS program is initiated by the student; it must be consistent with the nature and strengths of the College, but it may cross departmental and even college lines.

An individual program of study must have the following characteristics:

(1) The program must be constructed predominantly from the disciplines of science and engineering and be consistent with the purposes of Harvey Mudd College. It must differ from the other majors in a significant way and must have the approval of at least two faculty advisors, one from the Department of Humanities, Social Sciences, and the Arts and one from one of the technical departments as well as from the associate dean for academic affairs and the registrar.

(2) The program should contain at least 14 courses (42 credit hours) that make up a coherent set. Flexibility to choose among a large number of courses should not be at the expense of depth of concentration. Thus, at least two of the courses of this requirement should be taken in each of the last four semesters, and at least three of the courses should constitute a sequence.

(3) At least seven of the courses submitted under requirement (2) above must be taken at Harvey Mudd College.

(4) A student may not enter IPS after the sixth semester without prior approval by the Scholarly Standing Committee.

Many individual programs of study are interdisciplinary in nature. For example, a program may center on a field combining two of the traditional majors or on a field in science or engineering that is only partially covered by one of the majors. Alternatively, a program may seek to relate mathematics, physical science or engineering to an area of the social sciences or humanities. As illustrations of these possibilities, students have designed programs in architecture, environmental studies, geology and politics and technology.

OFF-CAMPUS MAJOR

Students may also choose to complete an off-campus major at one of the other Claremont Colleges in order to satisfy the "major" component of the curriculum. If this is the student's only major, then the student must also complete a minor in one of the Harvey Mudd College major-granting departments, along with all other graduation requirements, including the Common Core and the program in Humanities, Social Sciences, and the Arts. See "Minors" below. If the student is seeking to add an off-campus major as a second major, in addition to a regular Harvey Mudd major, then no minor is required.

An off-campus major (OCM) is overseen by the associate dean for academic affairs. A student contemplating an OCM in lieu of a regular Harvey Mudd major should consult with the Associate Dean about the application process. Since the requirements of the other college may be less than the Harvey Mudd requirements for an OCM (10 courses), it is important that the student begin this consultation early. All students taking off-campus majors as the sole major will be required to write a senior thesis or engage in some approved capstone experience (e.g., research, Clinic, internship). If the student is seeking to add an off-campus major as a second major, in addition to a regular Harvey Mudd major, then the capstone requirement is optional or at the discretion of the off-campus department offering the major.

In cases where courses in the off-campus major overlap with either or both of the Harvey Mudd humanities, social sciences and the arts concentration or the Harvey Mudd minor, up to four overlapping courses may be allowed to satisfy more than one of these departmental graduation requirements. Students are not allowed to seek off-campus majors that are offered as on-campus Harvey Mudd majors.

MINORS

A minor is available only to students electing an off-campus major (OCM) in lieu of a regular Harvey Mudd major. The minors described here are available only to Harvey Mudd students electing an off-campus major in lieu of a regular Harvey Mudd major. They are not open to participation from students at the other Claremont Colleges.

Biology: Biology 52 (required in Core), Biology 54, four additional biology courses, at least one of which must be a laboratory course. These courses are chosen with the approval of the student's biology advisor and are normally taken at Harvey Mudd.

Chemistry: A minor in chemistry shall consist of a coherent group of at least four non-laboratory courses beyond the required Core in two or more areas of chemistry, i.e. analytical, biochemistry, inorganic, organic and physical. In addition, the minor must include laboratories in at least two different areas beyond Core chemistry and Carbon Compounds laboratories (Chemistry 24 and Chemistry 58, respectively). The minor must be approved by the minor advisor.

Computer Science: Mathematics 55, Computer Science 60 or Computer Science 42, Computer Science 70; one of the following: Computer Science 105, Computer Science 121, Computer Science 131, Computer Science 140; and, any other upper division Computer Science course chosen with the consultation and approval of the minor advisor.

Engineering: The Engineering minor follows the same three-part model as the major. Students must complete seven engineering courses, as follows:

- Engineering Sciences (2): One of Engineering 82, 83, 84, 85 or 106 and one follow-on course in the same discipline as the first; and
- Engineering Systems (2): Engineering 59 (taken as part of the College's Common Core); and E101 and Design and Professional Practice (3); One of Engineering 4 or 111; and Engineering 8 and 80.

Mathematics: The student will propose a program designed in consultation with her or his mathematics advisor. Proposals must be approved by the Department of Mathematics Curriculum Committee and should consist of any five upper-division Mathematics courses (to include Mathematics 55) which form a coherent concentration or survey program. At least four must be Harvey Mudd or Harvey Mudd cooperative courses. Mathematics Clinic and Senior Thesis are normally excluded.

Physics: Physics 52, Quantum Physics (3 credits), and at least nine additional credits of physics or astronomy chosen with the help of a physics advisor.

EMPHASIS IN ENVIRONMENTAL ANALYSIS

Environmental analysis (EA) fits exceptionally well within the Harvey Mudd College mission to train students who combine technical rigor and engagement with pressing social issues. The Emphasis in Environmental Analysis provides a curricular program to help students move through their environmental studies in a coherent and cumulative fashion.

The Emphasis in Environmental Analysis is not a major or a minor. Rather, it is a coordinated program of study that allows students majoring in the sciences, engineering and mathematics the opportunity to address environmental issues from a range of perspectives so that they may better understand the impact of their work.

Emphasis Structure: An Emphasis in Environmental Analysis consists of six courses beyond the Core with significant environmental analysis content taken on- or off-campus, including at least three courses in recognized humanities, social sciences and the arts disciplines and two courses in science, engineering and mathematics. At least three of the courses must be at the upper-division level. Upon approval by the Harvey Mudd Center for Environmental Studies, one summer research, yearlong research or yearlong Clinic experience with a substantial environmental analysis component may be counted towards the six-course total.

Requirement: Students must declare their intention to pursue an Emphasis in Environmental Analysis in or before their fifth semester.

Certificate: Students who successfully meet the requirements for the Emphasis in Environmental Analysis will receive a certificate from the Harvey Mudd College Center for Environmental Studies.

GLOBAL CLINIC

The Harvey Mudd Clinic is an internationally recognized program initiated at Harvey Mudd in 1963. It brings student teams together with industry, government and nonprofit organizations to solve real-world industry problems in an academic setting. Built upon this foundation, the Global Clinic Program supports long-term sponsored engineering and science projects in which teams of Harvey Mudd students collaborate with teams of students from partnering schools all over the world. Students work on international team projects with members from different countries, cultures and institutional backgrounds, with different disciplinary interests and languages, but with a common unifying purpose and overarching project goals. Global Clinic students make a series of presentations and written progress reports during the year, honing their technical writing and public speaking skills. Further details can be found online at www.hmc.edu/global-clinic.

Students participating in Global Clinic register for the specific Clinic courses noted below, rather than the departmental Clinic course numbers in engineering, computer science, joint computer science/math, math or physics.

Global Clinic Courses (GLBL)

183, 184. GLOBAL CLINIC

DePillis, staff. Global Clinic is a yearlong commitment involving Harvey Mudd students and overseas collaborators, working together to find solutions to problems with international impact. Depending on the project, the Clinic team could be interdisciplinary. Permission to enroll is granted through an application process. Students from all Harvey Mudd departments are eligible to enroll; course may be substituted for the departmental Clinic course, as part of the application process required to enroll.

DUAL DEGREE PROGRAMS

Harvey Mudd College is currently participating in four dual degree programs with other members of The Claremont Colleges:

3-2 Program in Economics and Engineering with Claremont McKenna College
Harvey Mudd offers a 3-2 Program in Economics and Engineering in cooperation with Claremont McKenna College. The program is designed for students who want a liberal arts background, with emphasis on economics and management, and an engineering major. The students spend their first three years at Claremont McKenna College studying mathematics, science, economics, management and general education courses. At the end of the junior year, they may apply as transfer students. Accepted students must complete Harvey Mudd's requirements for general education and for the engineering major. Because curricular expectations for the 3-2 transfer program are specific, potential applicants are strongly encouraged to consult with the Harvey Mudd College Office of Admission as well as the chair of the Department of Engineering.

3-2 Program in Engineering with Scripps College
Harvey Mudd also has a 3-2 program in Engineering with Scripps College. The 3-2 Program with Scripps College does not include the emphasis on economics. The students reside at Scripps College for their first three years and cover a broad range of courses with emphasis in mathematics and science. Students accepted into the 3-2 program must complete Harvey Mudd's requirements for general education and for the engineering major. Because curricular expectations for the 3-2 transfer program are specific, potential applicants are strongly encouraged to consult with the Harvey Mudd Office of Admission as well as the chair of the Department of Engineering.

4+1 B.S. + MBA Program
Harvey Mudd College has an arrangement with the Peter F. Drucker and Masatoshi Ito Graduate School of Management at the Claremont Graduate University whereby qualified students can earn an MBA within 15 months of graduation from Harvey Mudd. Participation in this program will require early planning so that courses appropriate to both the Harvey Mudd and Drucker requirements will be taken. Interested students should consult with Professor Gary Evans before the middle of their sophomore year.

4+1 B.S. + M.S.I.S. Program
Harvey Mudd College has an arrangement with the School of Information Science at the Claremont Graduate University whereby qualified students can earn an M.S.I.S. in the year after their graduation from Harvey Mudd. Interested students should discuss this option with their faculty advisor during their sophomore year. The advisor and the student should then consult with the dean of the School of Information Science.

GRADUATE COURSES FOR UNDERGRADUATES

Most graduate courses are open to qualified undergraduates with the permission of the instructor. The following course is open to all undergraduates at The Claremont Colleges:

Education **170G CG. INTRODUCTION TO PUBLIC SCHOOL TEACHING (3)**
Students interested in pre-college teaching should contact the Teacher Education Program at CGU to arrange for courses that will meet the requirements for a teaching credential in California.

REGULATIONS

ACADEMIC REGULATIONS

Academic regulations are established by the faculty. Unless otherwise indicated in the College catalogue, exceptions to these regulations require the approval of the Scholarly Standing Committee. Written petitions for exceptions should be submitted to the registrar for consideration by the committee. It is the student's responsibility to make certain that all degree requirements are satisfied. A student's degree program, including the Core and major requirements, are governed by the catalogue in effect at the time of the student's matriculation as a degree-seeking student. Students may make a written request to complete the graduation requirements stated in a later catalogue in effect during their enrollment at the College, but they may not mix provisions from various catalogues.

GRADUATION REQUIREMENTS

In order to be recommended by the faculty for the Bachelor of Science degree, students are required to complete satisfactorily a minimum of 128 credit hours of courses (including approved transfer credits for courses taken at other colleges) with a minimum cumulative GPA of 2.000, the Common Core, the physical education requirement, and a major with a minimum major GPA of 2.000.

A student enrolled for at least 12 credit hours in one semester is considered a full-time student for that semester. In order to qualify for a degree, a student must spend her or his last four semesters full-time and complete satisfactorily at least 12 credit hours in the last of these semesters. For those considering study abroad, see Study Abroad.

No student may be enrolled at Harvey Mudd College for more than 10 semesters. Voluntary extensions of enrollment beyond the normal four-year course of study are not permitted.

To graduate, a student must earn a final cumulative grade point average (GPA) of C (2.000) or better. This cumulative GPA determines rank in class at graduation. In addition, she or he must earn a cumulative GPA of 2.000 or better in all courses required by the major, an individual program of studies or a technical minor for the off-campus major.

A student who wishes to graduate at the end of a specific semester must submit an application to do so. This application is due with the pre-registration materials for that final semester, and must be submitted by the date announced by the registrar. Applications that are received later than this time will be interpreted as applying to the semester following that semester.

A student is recommended by the faculty for a degree only when she or he has completed all academic obligations to the College. A diploma is awarded by the Board of Trustees only when the student has satisfied all disciplinary and financial obligations to the College. The Harvey Mudd Student Handbook contains more information regarding student disciplinary obligations in the Non-Academic Graduation Requirement policy.

GRADING REGULATIONS

The final grade of a student in each course is determined by the instructor. All grades are due to the Office of the Registrar by the appropriate (regular or senior) deadline date announced by the registrar. The deadline also applies to the grade "Incomplete" (INC) unless otherwise approved by the associate dean for academic affairs. (See the description of "Incomplete Grade.") In case an error has been made in determining, reporting or recording the grade in a course taken at the College, a change of grade form must be submitted to the registrar by the instructor. If the change of grade occurs beyond the end of the following semester, the registrar must forward the request for change to the Scholarly Standing Committee for its approval.

Protests about grades in courses taken at other Claremont Colleges are handled by the procedures of the college sponsoring the course, except in cases of alleged academic dishonesty.

For first-year students in their first semester of residence at Harvey Mudd, all courses numbered below 50 or identified as "frosh-friendly" electives at the time of fall registration are graded on the High Pass, Pass and No Credit scale.

First-year courses are typically numbered below 50. Lower division courses are those numbered 1 to 99. Upper division courses are those numbered 100 and above.

Grade Descriptions. Grades indicate both performance in the work of the course and comprehension of the subject matter. They are defined as follows:

A Excellent; 4 grade points per unit of credit.

B Good; 3 grade points per unit of credit.

C Fair; 2 grade points per unit of credit.

D Barely passing; 1 grade point per unit of credit.

F Failure; no grade points.

N The grade given at the end of the first semester of a two-semester course. The final grade is assigned at the end of the second semester. A two-semester course as designated by the Curriculum Committee is defined as a year-long, two-course sequence.

P Passing; satisfactory performance and mastery of course material for first-semester, first-year courses and when course grades are given on a pass/fail or pass/no credit basis. Equivalent to C- or better.

HP High Pass; superior performance and mastery of course material; first-semester, first-year courses only.

NC No Credit; first-semester, first-year courses and when course grades are given on pass/no credit basis. Students must repeat first-year courses until the course is passed.

INC Incomplete; the student's work for the course has not been completed, an extension of time to complete the course has been approved by the instructor and the associate dean for academic affairs, and a grade has not been reported.

W Withdrawn; The course was dropped after the Last Day to Drop. No credit earned, but no impact on the GPA.

Grades of A– (3.67 grade points), B+ (3.33), B– (2.67), C+ (2.33), C– (1.67), and D+ (1.33) may also be awarded for courses graded on the letter grade system. There is no grade of A+ or D–.

During the course, a code of IP (In Progress) is listed for a course in the grade field for reporting purposes. If no grade is submitted at the end of the course, a code of NR (Not Reported) is listed until a final grade is submitted by the instructor.

Other codes which may appear on a transcript for a course include:

AP Advanced Placement Credit; unit credit awarded. (Historical grade; AP credit no longer awarded.)

EX Passed by examination; unit credit awarded.

WV Waived requirement; no credit awarded, but requirement is deemed to have been satisfied. Does not reduce the number of credits required for graduation. Waived requirements appear on internal/unofficial transcripts only.

Computation of Grade Point Averages. Courses graded P, HP, NC, N, or W are omitted in computing grade point averages. A course with a temporary incomplete grade (INC) is omitted from the computation of grade point averages until graded coursework has been finalized and the grade changed (see below for more information on incomplete grading). Any grade of F is included when computing the grade point average, even if the course is taken again with a passing grade. In computing grade point averages for transfer students, all

Harvey Mudd courses are counted regardless of when they were taken. Courses at the other Claremont Colleges are counted only if taken while enrolled as a Harvey Mudd student. Courses taken outside of The Claremont Colleges may be counted toward credits required for graduation but do not affect GPA. Grade point averages are truncated after the third decimal place and are not rounded.

Incomplete Grade. An Incomplete is given only with the approval of the instructor(s) and the associate dean for academic affairs. An Incomplete is given only when illness or special circumstances justify the granting of the additional time for completion of the work. A student's performance in the course up to the time she or he became ill or when her or his work was otherwise disrupted is considered in granting an Incomplete. The Incomplete is removed if all work is completed by the time agreed upon by the instructor, the student and the associate dean for academic affairs and a final grade has been submitted by the instructor to the registrar's office. If the outstanding coursework is not submitted to the instructor by the agreed upon deadline, an Incomplete becomes an F or NC depending on the grading type.

Changing of Courses—Add/Drop/Withdrawal. A student may add a course until the official add date for the instructional period for that course, if adding the course will not cause an overload. Permission to overload is obtained from the associate dean for academic affairs. After the official add date deadline, a student may request a late add by submitting a petition to the Scholarly Standing Committee through the Office of the Registrar. A student may drop from any course without it being listed on her or his transcript so long as she or he remains enrolled in at least 12 credit hours and the drop occurs before the drop date determined by the academic calendar. If the course is part of the Core Program, the student must obtain the signature of the associate dean for academic affairs for the purpose of verifying consultation. After the official drop deadline but before the course withdrawal date, a student may still drop a course, but the course remains on the transcript with a grade of W (withdrawn). The grade of W does not affect GPA or earned credits. After the course withdrawal date, a student may request a withdrawal from a course by submitting a petition to the Scholarly Standing Committee through the Office of the Registrar. If the committee grants the withdrawal, the transcript will show a grade of W under the course in question. If the withdrawal is denied, the student must remain in the course and the grade earned is recorded on the transcript.

Involuntary Disenrollment Due to Non-Attendance. If a student fails to attend the first two meetings of a course (or one course meeting for courses meeting only one time per week) and the absences were not approved in advance by the instructor, the faculty member of record may ask the student's registrar to drop the student from the course. However, students will not automatically be dropped from a course they do not attend. The student may appeal to the home college for reinstatement into a dropped course before the add deadline only in instances when documented circumstances beyond the student's control prevented the student from attending the course and communicating with the instructor.

Involuntary Disenrollment Due to Student Conduct. When a prompt response may be essential, the Dean of Faculty has the authority to intervene in cases in which a student, after warning from the instructor, continues to engage in conduct which results in the substantial impairment of teaching or learning in a course. In such rare cases, the Dean of Faculty will interview the student, the instructor, other students in the course, and any additional persons deemed relevant, to determine a course of action—up to and including an involuntary withdrawal from the course. The student may invite any member of the Harvey Mudd community to act as an advocate on her or his behalf. This process is intended to remedy a situation that is disturbing the educational opportunities of other students and should not be interpreted as a disciplinary process. It thus does not preclude a case being filed with the appropriate judicial body by any party that believes the disruptive conduct constitutes a violation of any College code or policy.

Completion of Required Course Work. The last due date for the submission of work required to complete a course may be set by the instructor but may not be later than the date set by the registrar for the final examination in the course whether or not a final is given on the date assigned.

Pass/Fail. After the first semester of the first year, a student may select one course or the equivalent of 3 credits (in addition to physical education courses) each semester for which she or he will receive a grade of P (Pass) or F (Fail). However, none of the technical Core requirements or courses required for the major may be taken on a pass/fail basis. Not more than one course (or the equivalent of 3 credits) each academic year from among any one department's course offerings may be selected on the pass/fail basis. Approval in writing must be obtained from the course instructor and the student's advisor and must be submitted to the Office of the Registrar by the published deadline. The selection of a pass/fail course (or the reversal of that selection back to letter grades) cannot be made after the published deadline. A pass/fail course that has been passed is omitted in computing grade averages; the grade of F counts toward the GPA. The grade P is equivalent to C– or better in a course regularly letter-graded. Students earning a D+ or lower when opting for the Pass/Fail option will receive a grade of F.

Course Deficiencies. Students are required to take their approved fitness PE course during the first year. First-year Core courses—Biology 52, Chemistry 23A, 23B, 24; Computer Science 5; HSA 10; Mathematics 30, 35, 40 and 45; Physics 22, 23, 24; and Writing 1–must be attempted in the first year and passed before the beginning of the junior year. Core Lab 57, Mathematics 60, 65 and Physics 51 must be attempted in the sophomore year. Engineering 59 must be attempted by the fifth semester. The Scholarly Standing Committee tracks student progress through the Core and notifies students of Core deficiencies (e.g., courses that are dropped, withdrawn, failed or not appropriately attempted). Students must register for all deficient Core courses each time they are offered.

Grade Reports. Grades are viewable online on the portal. Grade reports are not mailed.

NOTIFICATION OF STUDENT RIGHTS

Per the Family Educational Rights and Privacy Act (FERPA), students at Harvey Mudd College are guaranteed certain rights in regard to the privacy of information from their education records. These rights are as follows:

The right to inspect and review the student's education records. Many elements of the student's record, including the academic transcript, are available to the student via secure login on the portal, portal.hmc.edu. For records not available on the portal, students must submit a written request to the registrar identifying the record(s) they wish to inspect. The registrar or, at the direction of the registrar, another appropriate College staff member will make arrangements for access and notify the student of the time and place where the records may be inspected. Applicants for admission who wish to review or to release to a third party their application documents (excepting letters of recommendation) should submit a written request to the Office of Admission identifying the records they wish to inspect.

The right to request the amendment of the student's education records that the student believes are inaccurate, misleading or an invasion of privacy. Students may ask the College to amend a record that they believe is inaccurate or misleading. They should write the College official responsible for the record, clearly identify the part of the record they want changed and specify why it is inaccurate, misleading or an invasion of privacy. If the College decides not to amend the record as requested by the student, the College will notify the student of the decision and advise the student of his or her right to a hearing regarding the request for amendment. Hearings will be conducted by the appropriate College hearing body. Students also have a right to have their personal written statement submitted and

retained by the recordkeeper for as long as the objectionable record is retained. Should the objectionable record be disclosed, the recordkeeper must also disclose the student's statement. Grades are not covered by this right-to-request amendment.

The right to consent to disclosures of personally identifiable information contained in the student's education records, except to the extent that FERPA authorizes disclosure without consent. One exception, which permits disclosure without consent, is disclosure to school officials with legitimate educational interests. A school official is defined as a person employed by the College, one of the other Claremont Colleges, or the Claremont University Consortium in an administrative, supervisory, academic (including faculty) or support staff position (including Campus Safety and Student Health Center staff); a person or company with whom the College has contracted (such as an attorney, auditor or collection agent); a person serving on the board of trustees; or a person assisting another school official in performing his or her tasks. A school official has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibility. Upon request, the College discloses education records without consent to officials of another school at which a student has informed the College that she/he seeks, intends to enroll and is enrolled. Some scholarship donors will require that students authorize disclosure to them of information pertaining to the student's academic progress.

The right to request that the College not disclose directory information. At its discretion, Harvey Mudd College may confirm or disclose "directory information" to the general public. The College defines "directory information" in accordance with FERPA as follows:

- Name
- Photo
- Harvey Mudd ID number
- Campus mailing address
- Major field of study
- Dates of attendance and classification
- Degrees and/or awards received
- Previous academic institutions attended
- Date of birth
- Campus email address
- Hometown

Under limited circumstances, home and cell telephone numbers may be released. The CMS Athletic Department may also release information about a student in compliance with normal practices for "team rosters," including height, weight and hometown. Per the Solomon Amendment, the College releases recruiting information to military recruiters. Recruiting information includes directory information that has not been restricted and may include year in school, place of birth and telephone number.

Students may request that their directory information not be released by signing a non-disclosure statement and submitting it to the registrar. All written requests for non-disclosure of directory information by current or former students will be honored until revoked by the student in writing. Harvey Mudd College assumes that failure on the part of any student to specifically request the withholding of directory information indicates individual approval for disclosure.

The right to file a complaint with the U.S. Department of Education concerning alleged failures by the College to comply with the requirements of FERPA. Complaints should be directed in writing to the following address:

Family Policy Compliance Office
U.S. Department of Education
400 Maryland Avenue, S.W.
Washington, DC 20202-5920

HONORS AND AWARDS

Graduation with Distinction and High Distinction. These honors are awarded for scholarly achievement at Harvey Mudd College. Students qualify for graduation with distinction if they have earned a cumulative grade point average of at least 3.300 and for graduation with high distinction if their cumulative grade point average is at least 3.700. Alternatively, by vote of the full faculty, students may be selected to receive either award.

Graduation with Departmental Honors. The faculty, usually upon recommendation of a department, may award honors to a graduating student for outstanding achievement. Each department's criteria may be obtained by contacting the department chair.

Dean's List. The Dean's List is determined after the completion of each fall or spring semester. It consists of the names of those students who have obtained a grade point average of 3.000 or better while taking 15 or more credits of credit, at least 12 of which are graded by letter grades (A to F). Those students on the Dean's List receive a notation on their transcript for the corresponding semester.

Letters of Commendation. Letters of commendation may be used to recognize exceptional student achievement in courses. Such letters are noted on students' transcripts. First-year students with high academic achievement in the first semester are given formal recognition by the associate dean for academic affairs, and a notation of "superior academic performance" is added to the transcript.

ACADEMIC STANDING

The record of every student is reviewed at least once per semester: at the end of each semester and at any other time that such a review seems pertinent. The Scholarly Standing Committee examines the records of those students who are not making satisfactory progress toward a degree. Such students are subject to notification and change of academic status as outlined in the following sections. Criteria for determining "satisfactory progress" include the grade point average in courses required for the major, the overall grade point average and grades for the latest semester's work. The notification sent to the student includes the reasons for the action and the prerequisites for return to regular status.

A student's academic standing is considered by faculty members and administrators when hiring or appointing students to time-consuming jobs and to positions where they serve as role models such as proctors, orientation directors and sponsors, graders, tutors or consultants.

Warning. The status "on Warning" is applied to students whose academic deficiencies do not warrant more stringent action. Students placed "on Warning" remain in good academic standing, and no formal notation is made on official transcripts. However, by being placed "on Warning," students are thereby notified that improved performance is expected. Ordinarily, a student whose semester GPA falls between 1.800 and 2.000 is placed "on Warning." A student with a Core course deficiency is also placed "on Warning" until the deficient course is passed.

Probation. Probation is a formal change of academic status, appearing on official transcripts, and indicating that the student must make substantial improvement or face the possibility of being declared ineligible to re-register at the College. A student on probation is no longer considered to be in good standing. Ordinarily, a student whose semester GPA falls below 1.800 is placed on probation.

Ineligible To Re-Register (ITR). A student in one of the following categories may be declared ineligible to re-register at Harvey Mudd College:

A student who is on probation and who fails to make substantial improvement in her or his academic record. (The amount of improvement expected is generally specified at the time probationary status is imposed.)

A student who satisfactorily completes fewer than eight credits during any semester. (Students receiving a grade of Incomplete may have their evaluations postponed until the Incomplete is finished.)

A student whose cumulative grade point average or semester grade point average is less than 2.000 for two successive semesters.

A junior or senior whose cumulative grade point average in the major is less than 2.000.

A student who has not passed all first-year Core courses (see Course Deficiencies) before the beginning of the fifth semester.

A student who has not attempted all Core courses by the end of the fifth semester. See Course Deficiencies.

A student who fails any Core course three or more times.

A student who is deficient in a Core course and has not registered for that course as specified in the Course Deficiencies section.

Mid-Term Warnings. Mid-term warnings may be given for unsatisfactory progress in a course.

Athletic Eligibility. To meet the eligibility requirements established by the College and the National Collegiate Athletic Association (NCAA), students who intend to participate in intercollegiate athletics must be enrolled in a minimum full-time program of study, maintain good academic standing and sustain satisfactory progress toward a degree. Any Harvey Mudd College student enrolled in 12 semester credits (a full-time student) and not on academic probation meets these "full-time program," "good academic standing," and "satisfactory progress" requirements.

Any student who has been placed on academic probation is ineligible for participation. All students have the right to appeal to the Scholarly Standing Committee for release from probation prior to the end of the semester. While approval of such a request is rare, the decision of the Committee would be based on performance indicators (i.e. mid-term exams).

REGULATIONS GOVERNING STUDENTS RECEIVING VETERANS BENEFITS

In accordance with CFR§21.4253(d)(3), Harvey Mudd College will conduct an evaluation of the previous education and training of those receiving Veterans benefits, grant appropriate credit, shorten the veteran or eligible person's duration of degree course proportionately, and notify the Veterans Administration and student accordingly. In accordance with CFR§21.4253(d)(1)(I), any veteran or eligible person who remains on probation for grade point deficiency below a 2.000 cumulative GPA beyond two semesters, will have her or his veteran's benefits discontinued. Certification of benefits will also be terminated.

ADVANCED PLACEMENT

Students may not earn credit on the basis of Advanced Placement exam scores alone. In general even introductory courses at Harvey Mudd go significantly beyond a normal AP course. As a result, success in AP courses does not guarantee advanced placement here, although some departments offer opportunities to be placed into higher-level courses or to be waived from taking certain courses. Placement examinations are offered during orientation and at scheduled times during the academic year.

CHALLENGING COURSES BY EXAMINATION (CREDIT BY EXAM AND WAIVERS)

A student in the College may challenge some courses by examination. If successful, the student may earn credit for the course (credits are earned and a grade of EX, which does not affect the grade point average, is recorded on the official transcript) or the student may be granted a non-credit waiver of the course requirement (no credits are earned, and a grade of WV appears on the internal, unofficial transcript only). A waiver allows a student to take a more advanced course instead of the challenged one; however, a waiver does not reduce the number of credits required for graduation. Since the courses that may be challenged are at the discretion of the department chair, a student must obtain the permission of the chair or her or his assignee before noon of the first day of classes of the semester in which she or he

wishes to be examined. Mastery of material covered in the course must be demonstrated in order to have a requirement waived while a very high level of mastery must be demonstrated for credit to be earned. The standards for earning the waiver or credit will be decided by the department chair. Some departments may choose not to award any credit but only to permit the waiver of a requirement. Standards are set high because it is believed that there is more than just knowledge of content to be gained from engaged participation in a course. A student may challenge a given course only once. Specific requirements for commonly challenged courses are below:

Biology: A placement examination is available for students who feel they have a strong background in biology. Students who pass the examination may take any three-unit Harvey Mudd biology course numbered above 100 as a substitute for Biology 52; this course should be completed no later than the third semester at the College. Exceptional performance on the examination may earn credit for Biology 52. The placement examination is offered during the first week of the fall semester only.

Chemistry: A placement examination is available for students who feel they have a strong background in chemistry. A high standard of performance earns unit credit for Chemistry 23A and/or Chemistry 23B. The examination is offered in the fall during new student orientation, or by prior arrangement with the department chair.

Mathematics: Advanced placement for courses can be earned by examination prior to enrolling in the course. Exams for Core courses in mathematics are offered in consultation with the appointed placement coordinator of the Department of Mathematics, typically within the first week of the fall semester. Students may earn waivers for course requirements, but no course credit.

Physics: Passing a departmental exam earns credit. Challenge examinations for Physics 23, 24 and 51 are typically offered in the fall semester.

Transfer Credit: Credit is given to transfer students for course work completed at other colleges that is reasonably equivalent to work offered at Harvey Mudd College. The amount of such credit is determined by the appropriate departments. Only C or better work is transferable. Some departments may specify a higher minimum grade for eligible transfer or may, at the discretion of the department chair, require the transfer student to complete an exam to determine the preparation of the student in the subject intended for transfer.

For transfer students, transcripts are evaluated at the time of admission so that students are informed at the time of acceptance what unit credit they have been awarded. Students will be asked to furnish course descriptions to facilitate this evaluation process. Courses underway are evaluated "subject to successful completion." Occasionally, transfer students are asked to take departmental examinations to establish credit.

When portions of the required Humanities, Social Sciences, and the Arts (HSA) program remain to be taken, up to half of these may be taken at other Claremont Colleges. In special cases of advanced admission to Harvey Mudd where few, if any, required HSA courses remain, the student must take one HSA course per semester. These are elective courses and up to half of them may be taken at other Claremont Colleges.

College-level coursework completed while still enrolled in high school is not transferable.

Summer School Credit and Courses Taken While on Leave from Harvey Mudd College: A student, whether a continuing student seeking summer school credit or a student on an approved leave of absence from Harvey Mudd College, who wishes to attend a college outside of The Claremont Colleges and transfer credits to Harvey Mudd College must obtain permission in writing from the chair of the Harvey Mudd College department concerned. To ensure transferability, permission should be obtained prior to registering for the course. Upon completion of the course(s), the student must request that the registrar's office at the host college or university send an official transcript directly to the Office of the Registrar at Harvey Mudd College. As a general rule, online courses are not transferable to Harvey Mudd, except

with the explicit approval of the department chair from whom the student is seeking transfer credit approval. The student must disclose the course format and method of delivery to the department chair at Harvey Mudd when seeking transfer credit approval. Only C-quality work or better is transferable. However, some departments set a higher minimum grade that must be received, if they are to be used for transfer credit. Approved courses are placed on the student's Harvey Mudd College academic record and may be counted as fulfilling requirements upon consent of the department chair. The registrar must be notified of any requirements that are satisfied by the transfer work. Unit credit at Harvey Mudd College for such courses is generally the same as for equivalent courses at Harvey Mudd except where adjustments must be made by the registrar to equalize credits (e.g., converting quarter system credits to the semester system). The grade obtained in a course outside of The Claremont Colleges is not counted in determining the student's cumulative grade point average.

COURSE REGISTRATION

Faculty Approvals. Prior to course registration and whenever course changes are made, students must have their course elections approved by their faculty advisors. Students are assigned a faculty advisor in their first year. That advisor approves course selections until the student declares a major, after which time an advisor (or advisors) in the major department(s) approves student course elections prior to registration. In addition, beginning in the spring of the first year, students are assigned an additional advisor in the Department of Humanities, Social Sciences, and the Arts (HSA), who must approve all course elections for HSA disciplines.

Overloads. In exceptional circumstances, a student with a record of successful academic performance may take more than 18 credit hours in a semester. The guidelines for overload approval are as follows:

Overloads for First-year. First-year students must request permission for overloads through a written petition to the associate dean for academic affairs. Petition instructions and deadlines are available from the Office of Academic Affairs.

Overloads for Sophomores, Juniors and Seniors.

1. For overloads of 19 1/2 credits or fewer: Overload approval requires the signature(s) of your academic advisors and a petition approved by the associate dean for academic affairs. Approval is granted provided previous semester GPA is at least 3.000 and all advisors agree.

2. For overloads of 20 to 21 credits: Overload approval requires the signature(s) of your academic advisors and a petition approved by the associate dean for academic affairs. A GPA of 3.000 in the preceding semester is required, as is evidence of the exceptional circumstances arguing for an overload. The following may constitute exceptional circumstances:

Unique opportunity to take complementary or synergizing courses

Unique opportunity to work with a particular faculty member (i.e., a visitor) or course (i.e., an experimental offering)

Scheduling difficulties created by future or past semesters abroad or on exchange

Unit credit needs for graduation within eight semesters.

Students are free to make the case for other exceptional circumstances in their petitions. The simple desire to take a course, however, does not constitute an exceptional circumstance, nor does evidence of a student's ability to "handle" additional coursework. The decision made by the associate dean for academic affairs regarding overload petitions is final.

3. For overloads of more than 21 credits: Granted only for the justification of unit credit needed for graduation in eight semesters and only then with the recommendation of all academic advisors.

Overload petition forms are available from (and returnable to) the Office of the Associate Dean for Academic Affairs.

Course Substitutions. A required Core course may only be replaced by an alternate course in a different area of study with the advance consent of the chair(s) of the department(s) concerned. Petition is required. A required course in the major may be replaced with a substitution with the consent of the student's major advisor and the department chair or department committee. Consult the department for the appropriate procedure. The registrar's office must be notified in writing by the relevant department chair of any substitution to the student's program of study.

Off-Campus Registration. Students may register for courses open to them in the other Claremont Colleges, many of which use a different method of recording credit than Harvey Mudd College. Full courses taken at Claremont Graduate University, Claremont McKenna College, Keck Graduate Institute of Applied Life Sciences, Pitzer College, Pomona College, or Scripps College receive three units of credit, except those courses in science and mathematics for which a three-hour laboratory is clearly indicated in the catalogue, in which case credit is determined by the registrar in consultation with the appropriate Harvey Mudd College department. Unit credit for off-campus courses other than full courses is typically proportional, though exceptions (e.g., for music lessons, physical education or dance activity courses) may be determined by the registrar in consultation with the appropriate Harvey Mudd College department. Any course in which a Harvey Mudd College student enrolls for credit, shown in the catalogue of any Claremont College, is indicated on the transcript with credit and grades recorded and is included in the calculation of the cumulative grade point average.

Directed Reading/Independent Study Courses. Directed reading courses are open to juniors and seniors only, and a student may take only one such course (or the equivalent of 3 credits) each semester. Students wishing to enroll in more than 3 units of directed reading/independent study credit must petition the Scholarly Standing Committee.

Foreign Languages. There are no degree requirements in foreign languages. Students planning to go to graduate school, however, are reminded that a reading knowledge of German, French or Russian may be required as part of a program leading to an advanced degree in the sciences. Further, students wishing to study abroad should plan to develop an appropriate fluency in the language of the country in which they intend to study.

FULL-TIME STATUS

A student enrolled for at least 12 credit hours in one semester is considered a full-time student for that semester. Harvey Mudd degree-seeking students are required to be full-time students, unless special permission is obtained to be enrolled in fewer than 12 credit hours. A student may petition the Scholarly Standing Committee to be enrolled in fewer than 12 credit hours (an "underload"); if approved, the student should note that enrollment below full-time status may adversely impact their progress toward the degree and/or their eligibility for financial aid. Students are expected to contact the Office of Financial Aid, the Office of Student Accounts, and their academic advisors prior to submitting a petition to underload.

CLASS ATTENDANCE

Students are expected to attend all classes and not miss class without adequate reason. The regulation of class attendance is ultimately the responsibility of the faculty. Each instructor has the privilege of establishing specific regulations regarding attendance as may be appropriate for her or his particular course.

LEAVES OF ABSENCE AND WITHDRAWALS

A student who plans to leave the College should arrange a voluntary withdrawal with the dean of students or the associate dean for academic affairs.

Leaves of absence for stipulated periods up to one year may be granted by the dean of students or the associate dean for academic affairs; all students departing on leave will receive

a letter setting the terms and conditions under which the student will be permitted to return to the College.

A student who has fully withdrawn from the College and wishes to be readmitted must apply to the Scholarly Standing Committee.

A student who withdraws or takes a leave of absence from the College before the semester course drop deadline will be noted as having withdrawn or taken a leave of absence with the previous semester's standing. No courses are listed on the transcript for the semester unless the course was completed before the leave date.

A student who withdraws or takes a leave of absence from the College after the semester course drop deadline but by the last day of classes for that semester receives a grade of W in all courses that have not been already graded. The registrar ascertains whether or not the student was in good standing.

A student who withdraws or takes a leave of absence from the College after the last day of classes for a given semester will still receive the grades earned in those courses in which she or he was enrolled at the time of leaving.

Procedures for arranging a leave of absence or withdrawal from the College are further detailed in the "Separation from the College Policies and Procedures" section of the Student Handbook.

PROGRAM OF TRANSFER STUDIES

Under special circumstances, a student may apply to the Scholarly Standing Committee for admission to the Program of Transfer Studies (PTS). The PTS provides a terminal semester during which the student is released from the usual course requirements, including registration in Core or major courses, in order to improve her or his academic standing and to prepare for transfer to another college at the end of the semester. Readmission to Harvey Mudd after the PTS semester is not permitted.

GENERAL REGULATIONS

Fees and Refunds. All charges (tuition, room, board, fees and deposits) must be paid in cash ($U.S.), by checks drawn on American or Canadian banks, or money order (international, if appropriate). Descriptions of fees and deposits follow; arrangement for payment must be made prior to the service.

Transcripts. Official copies of student transcripts are available through the Office of the Registrar. Fees apply for each official copy, whether provided to the student or sent to a third party at the student's request. Transcripts can only be issued if the student's financial obligations to the College have been paid in full or satisfactory arrangements have been made to do so. Requests for transcripts may be made electronically by following the instructions at hmc.edu/registrar. Unofficial transcripts are available at no charge to students and alumni online through the campus portal.

Class Fees. Individual classes may have additional fees associated with them. These fees are listed in the Schedule of Classes that is issued prior to pre-registration each semester. Class fees will be posted to student accounts and will be completely refunded if the drop is made on or before the last day to add classes. Class fees are non-refundable if drop/withdrawal is made after that date.

Damage Deposit/New Students. Half ($150) of first-year students' enrollment deposit ($300) is automatically converted to a housing damage deposit that is returned to students when they graduate or permanently leave the College. Each year, residence hall damage charges are deducted from the deposit and students are billed to return the deposit to $150. The other half of the enrollment deposit ($150) is automatically converted to a housing deposit that becomes a credit on a student's first bill. The enrollment deposit is non-refundable;

therefore the damage and housing deposits are non-refundable for new students who decide not to attend Harvey Mudd.

Refunds for Changes in Courseload to Less than Full Time. A student who drops below 10 credits in a regular semester may be eligible for a partial tuition refund. Students dropping below full-time status (12 credits) but remaining registered for 10 credits or more are ineligible for a refund. A student who wishes to change courseload to less than full-time must submit a Course Add/Drop Form and a Scholarly Standing Committee Petition to the Office of the Registrar. Students whose petitions are approved within the first 30 days of the semester are refunded according to the number of credits enrolled. No refunds are made after the first 30 days of the semester.

Refunds for Withdrawals During the Term. A student who wishes to withdraw from the College must give notice by completing a Withdrawal/Leave of Absence form with the dean of students or the associate dean for academic affairs, who then notifies the registrar and the Office of Student Accounts. No refunds are made if the student withdraws without giving notice. A student receives a refund, less a pro rata reduction of any scholarship or grant, subject to the following:

A 100 percent refund of charges and fees is made if withdrawal occurs before the first day of classes.

A 75 percent refund of the tuition charge is made if withdrawal occurs before the 18th day of classes.

A 50 percent refund of the tuition charge is made if withdrawal occurs after the first 17 days of classes, but by the 30th day of class.

No refund of the tuition charge is made after the 30th day of class.

Refund of the board charge is on a pro-rata basis.

No refund of the room charges or fees.

Refunds are made by the College within 30 days of completion of the Withdrawal/Leave of Absence form by the dean of students or the associate dean for academic affairs.

Questions regarding withdrawal should be directed to the dean of students or the associate dean for academic affairs. Questions regarding the College's refund policy or procedure should be directed to the Office of Student Accounts.

Note: When a student leaves Harvey Mudd prior to the end of a semester, the College determines whether a refund of charges is due as well as how much federal and institutional financial aid has been earned to pay for those charges. Refer to "Return of Federal Financial Aid Funds" in the "Understanding Your Financial Aid Award" brochure provided by the Office of Financial Aid.

AUTOMOBILES AND MOTORCYCLES

Every student living on or off campus who owns or operates an automobile, motorcycle, motor scooter, moped or motorbike on the campuses of The Claremont Colleges must register the vehicle with the Campus Safety Department at the opening of each semester. Vehicles must have liability insurance, and there is a parking fee of $30 per semester for students. First-year students are prohibited from bringing or parking cars on campus. Very limited exceptions may be made by contacting the Dean of Students.

MEDICAL REQUIREMENTS

The medical certificate required of all applicants prior to admission includes a physical examination, a tuberculin test, an X-ray of the chest within the preceding six months of those with a positive tuberculin test, and active immunization against tetanus, diphtheria, measles and rubella. Immunization against hepatitis B, meningococcal meningitis and chicken pox is also strongly recommended.

An accident and hospital reimbursement plan is required for all students to protect

against major costs if they are not covered by a family health insurance policy. This plan is designed to supplement the care provided by the health service. Premiums and coverage are described in a brochure available on the Student Health Service website. Enrollment in the Claremont health insurance plan is automatic if proof of outside coverage is not provided for each academic year.

International students must present proof of health insurance that meets or exceeds the Claremont health insurance plan coverage. International students will be automatically enrolled in the Claremont health insurance plan.

INSURANCE

The College does not assume responsibility for loss or damage to personal property belonging to students. Adequate insurance coverage is advised for everyone.

VISUAL MEDIA WAIVER

Harvey Mudd College reserves the right to photograph and/or videotape students, faculty, staff and guests while on College property, during College-sponsored events or during activities where they are representing the College. These images and audio may be used by Harvey Mudd College for promotional purposes, including use in the College magazine, press releases, booklets, brochures, flyers, newsletters, advertisements, the College website and associated sites, and other promotional materials. This serves as public notice of the College's intent to do so and as a release of permission to the College to use such images as it deems fit. If you should object to the use of your image, you have the right to withhold its release by filling out a form at the Office of Communications. Contact communications@hmc.edu.

FINANCIAL AID

As specified by law, Harvey Mudd College monitors its aid recipients to ensure that they are maintaining satisfactory academic progress toward completion of their degree. Students are normally expected to graduate after eight semesters of enrollment at Harvey Mudd or, for students who transfer into Harvey Mudd from another institution, after the pre-designated number of semesters required to complete graduation requirements. As Harvey Mudd students are generally eligible for only four years (or eight semesters) of financial assistance, normal academic progress must be maintained to ensure a timely graduation. Financial aid recipients should complete an average of 32 credits per year to meet the graduation requirement of 128 credits in four years and to remain eligible for financial aid. However, if there are extenuating circumstances that prevent degree completion within eight semesters, a student may apply for up to two additional semesters to complete the degree with financial aid. A student who wishes to pursue such an extension should consult with the associate dean for academic affairs.

Need-based financial aid is offered to U.S. citizens and permanent residents from the federal government, some states (including California for California state residents), private organizations and Harvey Mudd College. Harvey Mudd uses a national standard known as Institutional Methodology to determine eligibility for scholarship assistance. A limited amount of Harvey Mudd need-based scholarship is also available to international students. While need for scholarship is determined annually, the maximum annual award for international students will be limited to the amount granted in the first year at Harvey Mudd. An international student who does not apply for or does not receive aid as a first-year student will not be considered for financial aid in future years at Harvey Mudd due to the limited and highly competitive nature of our funding.

The Office of Financial Aid is required to coordinate all funds that a student receives to ensure that each student's financial need is met and that a student does not receive more financial aid than she or he qualifies for. For this reason, Harvey Mudd has established

policies on how the receipt of additional funds will affect financial aid eligibility. For example, if a student receives a Federal Pell Grant, a Cal Grant, other state grant, a Harvey Mudd–sponsored National Merit Scholarship or a Harvey S. Mudd Merit Award, the student's need-based Harvey Mudd Scholarship award will be reduced by an equal amount. If a student receives a scholarship or grant from a private organization, financial aid eligibility will be adjusted according to a standard formula. Students are eligible to reduce need-based student loans and/or Federal Work-Study funds with outside scholarship funds dollar to dollar. Once need-based student loans and Federal Work-Study amounts have been completely eliminated, any additional outside scholarships will reduce need-based Harvey Mudd Scholarships only. However, in an effort to maximize financial aid eligibility, students may retain need-based loan and Federal Work-Study amounts up to their federal eligibility.

The financial aid process at Harvey Mudd adheres to strict deadlines. Students must apply for financial aid by our published deadlines and submit all supporting documents in a timely manner. Failure to meet our published deadlines may jeopardize financial aid eligibility, as funds are awarded on a first come, first served basis. A student who receives financial aid and withdraws from Harvey Mudd during the semester will have her or his financial aid adjusted according to the actual period of enrollment and the terms of the aid program.

A student who becomes delinquent on student loan payments after she or he graduates or leaves Harvey Mudd may have academic transcripts withheld until payments are made current. Appeals to financial aid decisions should be addressed to the Office of Financial Aid.

Unresolved appeals may then be taken to the director of financial aid, the vice president and dean of admission and financial aid, and, finally, to the president of the College.

DELINQUENT ACCOUNTS

Every student is responsible for meeting promptly any payment due the College. Satisfactory arrangements for payment of the total charges on a student account for each semester, less financial aid, must be made prior to the beginning of each semester per the Tuition Payment Agreement.

A student account not meeting the requirements set forth in the Tuition Payment Agreement is considered delinquent. A student whose account is delinquent is subject to a late fee charge of one percent (1%) of the delinquent amount. A student with a delinquent account may be assessed a late-registration penalty and may also be disenrolled, resulting in prohibition from class attendance, revocation of dining hall privileges and/or ineligibility to pre-register for the subsequent semester. Any student leaving Harvey Mudd with an unpaid financial obligation will not be issued an official transcript of grades until settlement is made.

FACULTY

Stephen C. Adolph, *Stuart Mudd Professor of Biology and Chair, Department of Biology, 1993.* B.S., M.S., Stanford University; PhD, University of Washington. Lecturer, University of Texas, Austin; Visiting Assistant Professor, Middlebury College; Postdoctoral Research Associate, University of Wisconsin, Madison.

Anna N. Ahn, *Associate Professor of Biology, 2005.* B.A., PhD, University of California, Berkeley. Visiting Scientist, Massachusetts Institute of Technology; Postdoctoral Research Fellow, Harvard University.

William Alves, *Professor of Music and Chair, Department of Humanities, Social Sciences, and the Arts, 1995.* B.M., B.S., Trinity University; M.M., DMA, University of Southern California. Lecturer, University of Southern California; Lecturer, Scripps College; Fulbright Senior Scholar, Institut Seni Indonesia, Yogyakarta.

Isabel Balseiro, *Alexander and Adelaide Hixon Professor of Humanities, 1993.* B.A., Barnard College, Columbia University; PhD, New York University. Visitor with Associate Status, African Studies Centre, University of Cambridge; Lecturer, Rutgers University.

Hal S. Barron, *Louisa and Robert Miller Professor of Humanities, 1979.* A.B., Oberlin College; M.A., PhD, University of Pennsylvania. Postgraduate Research Historian, University of California, Riverside; Visiting Associate Professor, Waseda University, Tokyo, Japan; Vernon Carstensen Award; Graves Award; NEH Summer Fellow (twice); Haynes Fellow; Newberry Library NEH Fellow; Huntington Library-Haynes Fellow; NEH Senior Fellow.

Lori C. Bassman, *Professor of Engineering, 2000.* BSE, Princeton University; M.S., PhD, Stanford University. Associate Lecturer, University of Southern Queensland, Toowoomba, Australia; Research Assistant, Center for Integrated Systems, Stanford University; Teaching Assistant, Stanford University.

Arthur T. Benjamin, *Smallwood Family Professor of Mathematics, 1989.* B.S., Carnegie Mellon University; M.S., PhD, The Johns Hopkins University. Staff Member, National Security Agency, Washington, D.C.; Visiting Professor, California Institute of Technology.

Andrew J. Bernoff, *Kenneth A. and Diana G. Jonsson Professor of Mathematics, 1998.* B.S. Applied Math, B.S. Physics, Massachusetts Institute of Technology; PhD Trinity College, Cambridge. Member, Mathematical Sciences Research Institute, University of California, Berkeley; NSF Postdoctoral Fellow, University of California, Berkeley; Assistant Professor, Northwestern University; Visiting Faculty, Duke University; Visiting Scientist, University of British Columbia; Visiting Faculty, New York University.

James C. Boerkel Jr., *Assistant Professor of Computer Science, 2014.* B.S., Hope College; M.S., PhD, University of Michigan. Graduate Student Instructor, Research Mentor, University of Michigan; Visiting Assistant Professor, Harvey Mudd College.

Anthony Bright, *John Leland Atwood Professor of Engineering Science, 1986.* B.S., University of Manchester; M.S., Massachusetts Institute of Technology; PhD, University of Bradford. Instrument Engineer, Kellogg International, England; Visiting Researcher, UKAEA, Harwell, England; Lecturer, Teesside Polytechnic; Lecturer, Open University; Visiting Professor, University of Delaware.

Brian A. Bryce, *Assistant Professor of Engineering, 2015.* B.S., University of Maryland, College Park; M.S., PhD, Cornell University. Post-Doctoral Fellow, National Institute of Standards and Technology; Post-Doctoral Researcher, IBM Research; Sole Proprietor, teho Labs.

Eliot Bush, *Associate Professor of Biology, 2007.* B.S., Harvard University; PhD, California Institute of Technology. Postdoctoral Fellow, the University of Chicago.

Mary Cardenas, *Anthony W. LaFetra Chair in Environmental Engineering, 1995.* B.S., Iowa State University; M.S., PhD, University of California, Santa Barbara. Member of Technical Staff, Rocketdyne, Rockwell International; Research Scientist, University of California, Santa Barbara.

Alfonso Castro, *Professor of Mathematics, 2003.* B.S., M.S., Universidad Nacional de Colombia; PhD, University of Cincinnati. Chair, Department of Applied Mathematics, Professor of and Director of the Division of Mathematics, University of Texas, San Antonio; Associate and Full Professor, University of North Texas; Program Director: Applied Mathematics and Classical Analysis, National Science Foundation; Associate Professor, Southwest Texas State University; Visiting Professor, Universidad de Brasília; Associate and Full Professor, Associate Chairman, Mathematics, Centro de Investigación del I.P.N., Mexico.

Robert J. Cave, *Professor of Chemistry, 1988.* B.S., Michigan State University; PhD, California Institute of Technology. National Science Foundation Predoctoral Fellow; Postdoctoral Fellow, Indiana University; Camille and Henry Dreyfus Teacher-Scholar; Research Associate, Brookhaven National Laboratory; Visiting Professor, Rutgers University; Dean of Faculty, Harvey Mudd College; Associate Dean for Academic Affairs, Harvey Mudd College; Director of Study Abroad, Harvey Mudd College.

Philip D. Cha, P*rofessor of Engineering and C.F. Braun & Company Fellow, 1991.* B.S., Cornell University; M.S., PhD, University of Michigan. Senior Research Engineer, Ford Motor Company. Visiting Professor, University of Michigan; Participating Guest, Lawrence Livermore National Laboratory.

Chih-Yung Chen, *Associate Professor of Physics, 1990.* B.S., Normal University of Eastern China; M.S., University of Manchester; PhD, Massachusetts Institute of Technology. High School Teacher, Dafang, Guizhou, China.

Christopher Clark, *Professor of Engineering, 2012.* BASc, Queen's University; MASc, University of Toronto; PhD, Stanford University. Assistant, Associate Professor, California Polytechnic University, San Luis Obispo; Assistant Professor, University of Waterloo.

David Cubek, *Assistant Professor of Music and Director of the Claremont Concert Orchestra, Scripps College (Joint Music Program), 2010.* B.M., McGill University; Graduate Diploma, Conservatory of Montreal; DMA, Northwestern University. Director, University of Chicago Chamber Orchestra; Lecturer, McGill University; Lecturer, Northwestern University.

Albert Dato, *Assistant Professor of Engineering, 2014.* B.S., University of California, Davis; M.S., PhD, University of California, Berkeley. Process Development Engineer, Novellus Systems, Inc.; Scientist, Air Liquide Electronics; Founder and CEO, Graphene LLC.

G. William Daub, *Seeley Wintersmith Mudd Professor of Chemistry, 1978.* B.A., Pomona College; PhD, Stanford University. Postdoctoral Fellow, Stanford University; Camille and Henry Dreyfus Teacher-Scholar; Visiting Professor, University of California, Irvine.

Marianne de Laet, *Associate Professor of Anthropology and Science, Technology and Society, 2001.* B.A., M.A., University of Leiden; PhD, University of Utrecht. Senior Research Fellow and Lecturer, California Institute of Technology; NWO postdoctoral fellow at Columbia University; Bamberger and Fuld Fellow, Institute for Advanced Study at Princeton; Fulbright Scholar, University of California, Santa Cruz.

Lisette de Pillis, *Norman F. Sprague Jr., Professor of Life Sciences and Professor of Mathematics; Chair, Department of Mathematics, 1993.* B.A., University of California, San Diego; M.A., PhD, University of California, Los Angeles. Research Assistant, Michelsen Institute, Norway; Jet Propulsion Laboratory; Los Alamos National Laboratory.

Zachary Dodds, *Leonard-Johnson-Rae Professor of Computer Science, 1999.* B.A., M.S., PhD, Yale University. Research Fellow, Yale Center for Computational Vision and Control; Software Manager, HelpMate Robotics.

Matina C. Donaldson-Matasci, *Assistant Professor of Biology, 2014.* B.A., Reed College; PhD, University of Washington. Postdoctoral Fellow, University of Arizona; Postdoctoral Associate, Max Planck Institute for Evolutionary Biology.

Thomas D. Donnelly, *Professor of Physics and Core Curriculum Director, 1997.* B.A. Middlebury College; PhD University of California, Berkeley. Visiting Assistant Professor, Swarthmore College.

Ziyad H. Durón '81, *Jude and Eileen Laspa Professor of Engineering, 1987.* B.S., Harvey Mudd College; M.S., Massachusetts Institute of Technology; PhD, California Institute of Technology. Engineer, Arco Oil and Gas Company, NASA Dryden Flight Research Center; Member of the Technical Staff, The Aerospace Corporation; Visiting Research Associate, California Institute of Technology.

Erika W. Dyson, *Associate Professor of Religious Studies, 2009.* B.A., Mount Holyoke College; M.A., Columbia University, MPhil, Columbia University; PhD, Columbia University.

James C. Eckert, *Professor of Physics, 1980.* B.S., M.A., PhD, University of Southern California. Instructor, Loyola Marymount University; Visiting Associate Professor, University of Minnesota.

Michael A. Erlinger, *Csilla and Walt Foley Professor of Computer Science, 1981.* B.S., University of San Francisco; M.S., PhD, University of California, Los Angeles. Lecturer, University of California, Los Angeles; Technical Staff Member, Bell Telephone Laboratory; Senior Project Engineer, Hughes Aircraft Company; Member of the Technical Staff, The Aerospace Corporation.

Ann Esin, *Associate Professor of Physics, 2002.* B.S., Massachusetts Institute of Technology; A.M., PhD, Harvard University. Postdoctoral Fellow, Theoretical Astrophysics, California Institute of Technology; Visiting Assistant Professor, Harvey Mudd College.

Gary R. Evans, *Ruth and Harvey Berry Professor of Entrepreneurial Leadership and Director, Entrepreneurial Network, 1981.* B.A., California State University, Fresno; M.S., PhD, University of California, Riverside. Lecturer, University of California, Riverside.

Ken Fandell, *Michael G. and C. Jane Wilson Chair in Arts and the Humanities, 2012.* BFA, The School of the Art Institute of Chicago; MFA, University of Illinois at Chicago. Associate Professor and Chair, Department of Photography, The School of the Art Institute of Chicago; Visiting Artist, The University of Chicago; Instructor, Photography Department, University of Illinois at Chicago.

Okitsugu Furuya, *Clinical Professor of Engineering, 2010.* B.S., University of Tokyo; M.S., PhD, California Institute of Technology. Professor, Kogakuin University; CEO, Syn Tech Ltd., Japan: CEO, President, AMP Technology, Japan.

Jason Gallicchio, *Assistant Professor of Physics, 2015.* B.S., M.S., University of Illinois, Urbana-Champaign; PhD, Harvard University. Associate Fellow, University of Chicago Kavli Institute for Cosmological Physics; Station Science Leader, Amundsen-Scott South Pole Station; Post-Doctoral Fellow, University of California, Davis.

Sharon Gerbode, *Iris and Howard Critchell Assistant Professor of Physics, 2012.* B.S., University of California, Santa Cruz; M.S., PhD, Cornell University. Research Supervisor, Cornell University; Graduate Teaching Assistant, Cornell University; Physics Instructor, University of California, Santa Cruz.

Kash Gokli, *Professor of Manufacturing Practice, 2012.* B.S. University of Illinois, Urbana-Champaign, M.S., Gujarat University, India. Principal, Lean Transformation Consulting; Senior Vice President, Amano USA Holdings; Director of Engineering, C. Schmidt Company; Manufacturing Engineering Manager, Campbell Hausfeld.

Jeffrey D. Groves, *Professor of Literature and Vice President and R. Michael Shanahan Dean of the Faculty, 1988.* B.A., University of La Verne; M.A., PhD, The Claremont Graduate School. Instructor, Assistant Professor, Associate Professor, Professor, Harvey Mudd College.

Weiqing Gu, *Avery Professor of Mathematics and Director, Mathematics Clinic, 1996.* B.S., Shanghai Teachers University; M.S., PhD, University of Pennsylvania; Program Director, National Science Foundation.

Vivien Hamilton, *Assistant Professor of History, 2011.* BSc, Dalhousie University; M.A., PhD, University of Toronto. Instructor, University of Toronto.

David Money Harris, *Harvey S. Mudd Professor of Engineering Design, 1998.* S.B. and MEng, Massachusetts Institute of Technology; PhD, Stanford. Technical Staff Member, Sun Microsystems and Intel Corporation.

Richard C. Haskell, *Burton G. Bettingen Professor of Physics, Director, Physics Clinic, and Director, Center for Environmental Studies, 1980.* B.S., Lehigh University; PhD, The Johns Hopkins University. NIH Postdoctoral Fellow, Muscular Dystrophy Postdoctoral Fellow, Associate Research Scientist, The Johns Hopkins University.

Karl A. Haushalter, *Associate Professor of Chemistry and Biology and Associate Dean of Research and Experiential Learning, 2003.* B.A., Rice University; PhD, Harvard University. Postdoctoral Fellow, University of California, San Diego; Visiting Lecturer, University of California, Irvine.

Lelia Hawkins, *Barbara Stokes Dewey Assistant Professor of Chemistry, 2011.* B.S., University of California, San Diego; PhD, Scripps Institution of Oceanography, UCSD. Teaching and Research Postdoctoral Associate, University of San Diego; Instructor, University of San Diego.

Jae Hur, *Assistant Professor of Biology, 2015.* B.S., California Institute of Technology; PhD, Harvard University. Visiting Assistant Professor of Biology, Harvey Mudd College; Post-Doctoral Fellow, University of California, Los Angeles; Post-Doctoral Fellow, Harvard University.

Jon Jacobsen, *Professor of Mathematics and Interim Vice President for Student Affairs, 2002.* B.S., M.S., California Polytechnic State University, San Luis Obispo; PhD University of Utah. S. Chowla Research Assistant Professor, The Pennsylvania State University, Visiting Scholar in the Faculty of Science, University of Alberta.

Adam R. Johnson, *Professor of Chemistry, 1999.* B.A., Oberlin College; PhD, Massachusetts Institute of Technology. Postdoctoral Fellow, University of California; Visiting Scholar, California Institute of Technology.

Charles Kamm, *Associate Professor of Music and Director of Choirs, Scripps College (Joint Music Program), 2005*. B.A., Earlham College; M.M., Michigan State University; DMA, Yale University. Director of Choral Activities, Vassar College; Fulbright Fellowship, Sibelius Academy, Helsinki, Finland.

Dagan Karp, *Associate Professor of Mathematics and Associate Department Chair, 2008.* BSc, MSc, Tulane University; PhD, University of British Columbia. Visiting Assistant Professor, University of California, Berkeley.

Kerry K. Karukstis, *Ray and Mary Ingwersen Professor of Chemistry and Chair, Department of Chemistry, 1984.* B.S., PhD, Duke University. National Institutes of Health Postdoctoral Fellow, University of California, Berkeley; Henry Dreyfus Teacher-Scholar; Visiting Research Scientist, Chemical Biodynamics Division, Lawrence Berkeley Laboratory.

Robert M. Keller, *Professor of Computer Science, 1991.* B.S., M.S., Washington University; PhD, University of California, Berkeley. Assistant Professor, Princeton University; Visiting Assistant Professor, Stanford University; Associate and Full Professor, University of Utah; Director of Research and Vice President, Research and Development, Quintus Corporation; Professor and Chair, Division of Computer Science, University of California, Davis; Visiting Scientist, Lawrence Livermore National Laboratory; Senior Staff Member, Jet Propulsion Laboratory; Technical Staff Member, The Aerospace Corporation.

Gordon C. Krauss, *Fletcher Jones Professor of Engineering Design, 2013.* B.S., Haverford College; M.S., PhD, Boston University. Course Coordinator and Lead Instructor, Capstone Design Course, University of Michigan Department of Mechanical Engineering; Director, Metalworking Fluids Initiative, University of Michigan Department of Mechanical Engineering; Staff Scientist, Energizer-Schick/Wilkinson Sword Division; Technology Specialist, Ford Motor Company; Research and Development Engineer, Tytronics Corporation-Micromet Instruments.

Geoffrey Kuenning, *Professor of Computer Science and Director, Computer Science Clinic, 1998.* B.S., M.S., Michigan State University; PhD, University of California, Los Angeles. Computer Scientist, Lawrence Livermore Laboratory; Systems Programmer, Ball Computer Products; Senior Software Engineer, Digital Equipment Corporation; Manager of Operating Systems Development, Callan Data Systems; Principal Consultant, Interrupt Technology Corporation; Visiting Lecturer, University of California, Los Angeles.

Nancy K. Lape, *Associate Professor of Engineering and Associate Department Chair, 2005.* B.S., University of Massachusetts, Amherst; PhD, University of Minnesota, Twin Cities. Postdoctoral Fellow, Laboratoire des Science du Génie Chimique, CNRS, Ecole Nationale Supérieure des Industries Chimiques; Graduate Research Fellow, Recitation Instructor, University of Minnesota.

Rachel Levy, *Associate Professor of Mathematics and Associate Dean for Faculty Development, 2007.* B.A., Oberlin College; M.A., University of North Carolina at Chapel Hill; PhD, North Carolina State University. Postdoctoral Research Associate, Duke University; Graduate Research Assistant, North Carolina State University; Upper School Dean, Carolina Friends School; Educational Software Consultant, SAS Institute.

Colleen M. Lewis, *Assistant Professor of Computer Science, 2012.* B.S., M.S., PhD, University of California at Berkeley. Computer Science Lecturer, The University of California at Berkeley.

Ran Libeskind-Hadas, *R. Michael Shanahan Professor of Computer Science and Chair, Computer Science Department, 1993.* B.A., Harvard University; M.S., PhD, University of Illinois (GTE Fellow).

Patrick Little, *J. Stanley and Mary Wig Johnson Professor of Engineering Management and Director, Global Clinic, 1996.* B.A., St. Johns University; M.S., DSc, Massachusetts Institute of Technology.

Theresa Lynn, *Associate Professor of Physics, 2006.* B.A., Harvard-Radcliffe Colleges; M.A., PhD, California Institute of Technology. Staff Scientist, Postdoctoral Scholar, Kellogg Radiation Laboratory, California Institute of Technology; Adjunct Assistant Professor, Harvey Mudd College; Co-founder, Caltech Project for Effective Teaching; Project Coordinator, California High School Cosmic Ray Observatory (CHICOS)

Gregory A. Lyzenga '75, *Professor of Physics, 1990.* B.S., Harvey Mudd College; PhD, California Institute of Technology. Postdoctoral Research Fellow, California Institute of Technology; Member Technical Staff, Technical Group Leader, Jet Propulsion Laboratory.

Susan E. Martonosi, *Joseph B. Platt Associate Professor of Mathematics, 2005.* B.S., Cornell University; PhD, Massachusetts Institute of Technology. Research Assistant, MIT Global Airline Industry Center; Teaching Assistant, Sloan School of Business; High School Mathematics Teacher, U.S. Peace Corps, Republic of Guinea.

Debra Mashek, *Associate Professor of Psychology, 2005.* B.S., Nebraska Wesleyan University; M.A., PhD, State University of New York at Stony Brook. Research Assistant Professor, George Mason University; Postdoctoral Research Fellow, George Mason University.

Rachel Mayeri, *Professor of Media Studies, 2002.* B.A., Brown University; MFA, University of California, San Diego. Adjunct Professor, University of California, San Diego.

Catherine S. McFadden, *Vivian and D. Kenneth Baker Professor in the Life Sciences, 1991.* B.S., Yale University; PhD, University of Washington. Postdoctoral Researcher, University of California, Davis; NATO Postdoctoral Fellow, Port Erin Marine Laboratory, Isle of Man; Research Associate, University College, Dublin.

Julie Medero, *Assistant Professor of Computer Science, 2014.* B.A., Swarthmore College, M.S., PhD, University of Washington. Graduate Research Assistant, University of Washington; Research Intern, Microsoft Research.

Mohamed Omar, *Assistant Professor of Mathematics, 2013.* BMath., MMath., University of Waterloo; PhD, University of California, Davis. Harry Bateman Research Instructor, California Institute of Technology.

Melissa E. O'Neill, *Professor of Computer Science, 2001.* BSc, University of East Anglia; MSc, PhD, Simon Fraser University. Instructor, Simon Fraser University.

Michael Orrison Jr., *Professor of Mathematics, 2001.* A.B., Wabash College; A.M., PhD, Dartmouth College. Lecturer, Dartmouth College.

Elizabeth J. Orwin '95, *James Howard Kindelberger Professor of Engineering and Chair, Department of Engineering, 2001.* B.S., Harvey Mudd College; M.S., PhD, University of Minnesota. Research Assistant, University of Minnesota.

Nicholas Pippenger, *Professor of Mathematics, 2006.* B.S., Shimer College; B.S., M.S., PhD, Massachusetts Institute of Technology. Professor of Computer Science, Princeton University; Professor of Computer Science, University of British Columbia; MIT Instrumentation Laboratory (now the Charles Stark Draper Laboratory); IBM Research; University of British Columbia; IBM Fellow, Almaden IBM Research Center.

Salvador Plascencia, *Assistant Professor of Creative Writing, 2015.* B.A., Whittier College; MFA, Syracuse University; M.A., University of Southern California. Novelist, Harcourt Press; Visiting Writer, Pitzer College; Visiting Assistant Professor, University of California, Riverside; Moseley Fellow, Pomona College.

Jules B. Prag IV, *Visiting Associate Professor, (2004).* BBA, M.A., University of Florida; M.A., PhD, University of Rochester. Assistant Professor, Claremont McKenna College; Visiting Associate Professor, Pomona College; Visiting Associate Professor, Clinical Associate Professor, Claremont Graduate University.

Donald S. Remer, *Oliver C. Field Professor of Engineering Economics, 1975.* B.S., University of Michigan; M.S., PhD, California Institute of Technology. Engineering Economic and Planning Analyst, Senior Project and Process Engineer, Task Force Manager, Exxon Chemical Company; Case Study Editor, The Engineering Economist; Member of the Technical Staff, Manager of Planning Analysis, Jet Propulsion Laboratory; Registered Professional Engineer, California.

Peter N. Saeta, *Professor of Physics and Chair, Department of Physics, 1995.* B.S., Stanford University; PhD, Harvard University. Postdoctoral Fellow, AT&T Bell Laboratories; National Research Council Postdoctoral Fellow, National Institute of Standards and Technology.

Vatche V. Sahakian, *Associate Professor of Physics, 2003.* BSc, MSc, McGill University; PhD, University of Chicago. Postdoctoral Associate, Lecturer, Cornell University.

Christy Spackman, *Hixon-Riggs Visiting Scholar, 2015.* B.S., Brigham Young University; M.S., University of Illinois at Urbana-Champaign; PhD, New York University. Adjunct Instructor, New York University; Adjunct Instructor, University of Vermont.

Patricia D. Sparks, *Professor of Physics, 1989.* B.A., Carleton College; M.S., PhD, Cornell University. Postdoctoral Fellow, University of California, Los Angeles; Lecturer, California State University, Fullerton; Visiting Scientist, University of California, Irvine.

Matthew Spencer, *Assistant Professor of Engineering, 2015.* B.S., M.S., Massachusetts Institute of Technology; PhD, University of California, Berkeley. Visiting Assistant Professor of Engineering, Harvey Mudd College; Instructor, University of California, Berkeley.

R. Erik Spjut, *Professor of Engineering, Union Oil Company Engineering Design Fellow and Director, Engineering Clinic, 1988.* B.S., University of Utah; PhD, Massachusetts Institute of Technology. Assistant Professor, Massachusetts Institute of Technology.

Tanja Srebotnjak, *Hixon Professor of Sustainable Environmental Design, 2014.* Diploma, Dortmund Technical University, Germany; M.S., University of Auckland, New Zealand; PhD, Yale University. Public Health Research Fellow, Natural Resources Defense Council; Rsearch Affiliate, Yale Center for Environmental Law and Policy; Senior Fellow, Ecologic Institute; Postdoctoral Research Fellow, Institute for Health Metrics and Evaluation, University of Washington; Statistician, United Nations.

Paul F. Steinberg, *Malcolm Lewis '67 Professor of Sustainability and Society, 2003.* B.A., University of California, Santa Barbara; MPA, Harvard University, John F. Kennedy School of Government; PhD, University of California, Santa Cruz. Visiting Scholar, Paul H. Nitze School of Advanced International Studies, Johns Hopkins University; Visiting Assistant Professor, Duke University; Founding Director, Conservation Policy and Governance Program, RARE Center for Tropical Conservation; policy advisor to The World Bank, Conservation International, World Conservation Union and Natural Resources Defense Council.

Daniel M. Stoebel, *Assistant Professor of Biology, 2010.* B.A., Pomona College, PhD, The State University of New York, Stony Brook. Postdoctoral Research Fellow, Department of Microbiology, Trinity College, Dublin.

Christopher A. Stone, *Professor of Computer Science, 2000.* B.S., M.S., PhD, Carnegie Mellon University.

Francis E. Su, *Benediktsson-Karwa Professor of Mathematics, 1996.* B.S., University of Texas, Austin; A.M., PhD, Harvard University. Visiting Assistant Professor, Cornell University.

Lisa M. Sullivan, *Willard W. Keith Jr. Fellow in the Humanities and Professor of Economic History and Chair of the Faculty (2013–2016), 1990.* B.A., Vassar College; M.A., PhD, University of Toronto. Assistant Professor, State University of New York, Fredonia; Research Fellow, Winterthur Museum; Associate Dean of Academic Affairs, Harvey Mudd College; Associate Dean for Faculty Development, Harvey Mudd College.

Elizabeth A. Sweedyk, *Associate Professor of Computer Science, 1999.* B.A., Michigan State University; BSE, MSE, University of Michigan; PhD, University of California, Berkeley. Instructor, University of Pennsylvania, Instructor, Rutgers University, Researcher, Sandia National Laboratories.

Chang Tan, *Associate Professor of Chinese Language and Culture, 2008.* B.A., Beijing University; M.A., PhD, University of Texas at Austin. Visiting Professor, Southwestern University.

John S. Townsend, *Susan and Bruce Worster Professor of Physics, 1975.* B.S., Duke University; M.A., PhD, The Johns Hopkins University. National Science Foundation Graduate Fellow, Associate Research Scientist and Lecturer, The Johns Hopkins University; Research Associate, Stanford Linear Accelerator Center, Stanford University; Visiting Associate, California Institute of Technology; Visiting Fellow, University of Southampton, England; Science Fellow, Center for International Security and Arms Control, Stanford University; Visiting Professor, Duke University.

Katherine Elizabeth Trushkowsky, *Assistant Professor of Computer Science, 2014.* B.S., Duke University; M.S., PhD, University of California, Berkeley. Graduate Student Researcher, Intel Research, University of California.

Gerald R. Van Hecke '61, *Donald A. Strauss Professor of Chemistry, 1970.* B.S., Harvey Mudd College; M.A., PhD, Princeton University. Teaching and Research Assistant, Princeton University; Chemist, Shell Development Company; Visiting Research Associate, University of Lille, France; Visiting Research Associate, Boston University Medical School; NAS Exchange Scientist: Institute of Physical Chemistry, Warsaw; Institute for Electron Physics, East Berlin; NASA/ASEE Faculty Fellow, Jet Propulsion Laboratory; University Guest Researcher, Osaka University; Guest Professor, University of Southampton; Camille and Henry Dreyfus Scholar; Certified Professional Chemist; National Certification Commission.

Katherine M. Van Heuvelen, *Assistant Professor of Chemistry, 2012.* B.A., St. Olaf College, PhD, University of Wisconsin-Madison. Teaching Assistant, University of Wisconsin-Madison and St. Olaf College.

Hal Van Ryswyk, *John Stauffer Professor of Chemistry, 1986.* B.A., Carleton College; PhD, University of Wisconsin. Visiting Associate Professor, Massachusetts Institute of Technology; Visiting Professor, Stanford University.

David A. Vosburg, *Associate Professor of Chemistry, 2005.* B.A., Williams College; PhD, Scripps Research Institute. Jane Coffin Childs Postdoctoral Fellow, Harvard Medical School.

Ruye Wang, *Professor of Engineering, 1990.* M.S., Tianjin University, China; M.S., PhD, Rutgers University. Lecturer, Peking University, China.

Benjamin Wiedermann, *Assistant Professor of Computer Science, 2012.* B.A., Boston University; PhD, University of Texas at Austin. Visiting Assistant Professor, Harvey Mudd College; Co-founder, No One Way Arts Collaborative, LLC, Denver, Colorado; Author, Deitel & Associates, Boston, Massachusetts.

Talithia D. Williams, *Associate Professor of Mathematics, 2008.* B.S., Spelman College; M.S., Howard University; M.A., PhD, Rice University; Lecturer, Rice University.

Darryl Wright, *Willard W. Keith Jr. Fellow in the Humanities and Professor of Philosophy, 1991.* B.A., Princeton University; PhD, University of Michigan. Instructor, University of Michigan.

Qimin Yang, *Professor of Engineering and Associate Director, Engineering Clinic, 2002.* B.S., Zhejiang University; M.S., Beijing University of Posts and Telecommunication; PhD, Princeton University. Research Assistant, Princeton University.

Darryl H. Yong '96, *Professor of Mathematics and Associate Dean for Diversity, 2003.* B.S., Harvey Mudd College; M.S., Claremont Graduate School; PhD, University of Washington. Von Kármán Instructor, California Institute of Technology; Visiting Assistant Professor, Harvey Mudd College.

JOINT ATHLETICS FACULTY

Harvey Mudd College has partnered with Claremont McKenna and Scripps colleges since 1956 to provide students with state-of-the-art athletic facilities and coaches with expertise in 21 (10 men's, 11 women's) varsity sports. This joint program is known as CMS athletics (Claremont-Mudd-Scripps), and its primary purpose is to enhance student development and personal growth through participation in intercollegiate athletics. The entire CMS faculty is listed below, though only one-third of them are officially assigned to Harvey Mudd at any time.

Michael Sutton, *Professor of Physical Education and Athletic Director, 1979*. B.A., Claremont McKenna College; M.S., United States Sports Academy. Head Men's Water Polo Coach, Head Men's and Women's Swim Coach, Claremont-Mudd-Scripps Colleges 1979–2000; Team Leader, United States Water Polo Men's Olympic and National Team, 1988–1992.

Jodie Rae Burton, *Professor of Physical Education and Head Women's Golf Coach, Senior Women's Administrator and Associate Athletic Director, 1979.* B.S., M.S., California State Polytechnic University, Pomona. Teacher-Coach, Polytechnic School, Pasadena.

Kristen Dowling, *Assistant Professor of Physical Education and Head Women's Basketball Coach, 2012.* B.A., University of Redlands. M.A., Pepperdine University. Assistant Women's Basketball Coach, Pepperdine University.

John Goldhammer, *Professor of Physical Education and Head Men's and Women's Cross Country Coach and Associate Athletic Director, 1984.* B.A., University of California, Santa Barbara. M.A., California State University, Los Angeles; Instructor and Track and Field Coach, Santa Barbara City College; Assistant Women's Track Coach and Men's Field Event Coach, University of California, Santa Barbara.

Charles Griffiths, *Associate Professor of Physical Education and Head Men's and Women's Swimming Coach, 2001.* B.A., Denison University. Assistant Men's and Women's Swim Coach, Denison University.

Betsy Hipple, *Assistant Professor of Physical Education and Head Women's Softball Coach, 2005.* B.S., Northeastern University; M.S., University of Utah. Head Softball Coach, Hunter College (City University of New York).

Greg Lonzo, *Assistant Professor of Physical Education and Head Men's and Women's Water Polo Coach, 2001.* Pepperdine, 2002, three time NCAA Water Polo All-American. CMS Interim head coach, 2007–08. CMS Assistant coach 2004-05. Head coach Riverside Water Polo Club, 2002–2007.

Keri Sanchez, *Associate Professor of Physical Education and Head Women's Soccer Coach, 2003.* B.A., University of North Carolina, Chapel Hill; M.A., University of Oregon. WUSA player and Assistant Coach, University of Oregon.

Kenneth Scalmanini, *Assistant Professor of Physical Education and Head Men's Basketball Coach, 1999.* A.A., Santa Rosa Junior College; B.S., California State Polytechnic University, Pomona; M.S. candidate, Azusa Pacific University. Assistant Men's Basketball Coach, Claremont-Mudd-Scripps Colleges.

Paul Settles, *Associate Professor of Physical Education and Head Men's Tennis Coach, 2004.* B.A., University of Pennsylvania, M.A. Phil, Cambridge University. Director of Player Services, ATP, Ponte Vedra, Fla.

Kyle Sweeney, *Assistant Professor of Physical Education and Head Football Coach, 2011.* B.S. Occidental College; M.S. Illinois State University. Defensive Coordinator, University of Chicago; Head Football Coach, MacMurray University; Defensive Coordinator, Endicott College; Assistant Coach, Illinois Wesleyan University; Recruiting Assistant, Occidental College.

Lauren Uhr, *Assistant Professor of Physical Education and Head Women's Lacrosse Coach, 2014.* B.A., Fairfield University. Head Women's Lacrosse Coach, Saint Mary's College.

Kurt Vlasich, *Assistant Professor of Physical Education and Head Volleyball Coach, 2010.* B.A., Pepperdine University. Assistant Volleyball Coach, Claremont-Mudd-Scripps Colleges, Club Director/Head Coach, Club West Volleyball.

William Walkenbach, *Assistant Professor of Physical Education and Head Baseball Coach, 2015.* B.S., Cornell University. M.A., Georgia State University. Head Baseball Coach, Cornell University. Head Baseball Coach, Franklin & Marshall College. Assistant Baseball Coach Emory University.

HARVEY MUDD EMERITI

Elizabeth Baughman, *Staff Emerita, 2014*
Carl J. Baumgaertner, *Clinical Professor of Engineering Emeritus, 1987.*
Tad A. Beckman, *Professor of Philosophy Emeritus, 1961.*
Courtney S. Coleman, *Professor of Mathematics Emeritus, 1959.*
Iris C. Critchell, *Instructor of Aeronautics Emerita, 1962.*
Clive L. Dym, *Professor of Engineering Emeritus, 1991.*
Deren Finks, *Dean of Admission Emeritus, 1988.*
Mack Gilkeson, *Professor of Engineering Emeritus, 1961.*
Daniel L. Goroff, *Professor of Mathematics and Economics, Vice President and Dean of the Faculty Emeritus, 2005.*
John Greever, *Professor of Mathematics Emeritus, 1961.*
Thomas M. Helliwell, *Professor of Physics and Dean Emeritus, 1962.*
Robert T. Ives, *Associate Professor of Mathematics Emeritus, 1958.*
Joseph A. King, *Professor of Engineering Emeritus, 1986.*
Henry A. Krieger, *Professor of Mathematics Emeritus, 1968.*
Mitsuru Kubota, *Professor of Chemistry Emeritus, 1959.*
Betty Lumpkin, *Registrar Emerita, 1961.*
John I. Molinder, *Professor of Engineering Emeritus, 1970*
James E. Monson, *Professor of Engineering Emeritus, 1961.*
Philip C. Myhre, *Professor of Chemistry Emeritus, 1960.*
Jeanne Noda, *Vice President and Dean of Students Emerita, 1994.*
Richard G. Olson '62, *Professor of History Emeritus, 1976*
Daniel C. Petersen, *Professor of Physics Emeritus, 1974.*
J. Richard Phillips, *Professor of Engineering Emeritus, 1966.*
Alden F. Pixley, *Professor of Mathematics Emeritus, 1962.*
William K. Purves, *Professor of Biology Emeritus, 1977.*
David S. Sanders, *Professor of Literature Emeritus, 1959.*
Jon C. Strauss, *President Emeritus, 2006*
Wing Cheung Tam, *Professor of Engineering and Computer Science Emeritus, 1974.*
B. Samuel Tanenbaum, *Professor of Life Sciences and Engineering and Dean Emeritus, 1975.*
Jack H. Waggoner Jr., *Associate Professor of Physics Emeritus, 1961.*
F. Sheldon Wettack, *Professor of Chemistry and Dean Emeritus, 1993.*
Robert P. Wolf, *Professor of Physics Emeritus, 1963.*

SENIOR ADMINISTRATION

PRESIDENT OF THE COLLEGE

Maria M. Klawe, *President, 2006.* BSc, PhD, University of Alberta. Academic positions at Princeton University, University of British Columbia, University of Toronto and Oakland University. Research Scientist and Manager, IBM Almaden Research Center, California; Computer Science Department Head, Vice President of Student and Academic Services, and Dean of Science, University of British Columbia; Dean of Engineering and Professor of Computer Science, Princeton University.

PRESIDENT'S CABINET

Karen Angemi, *Director of the President's Office and Secretary to the Board, 2003.*

Thyra L. Briggs, *Vice President for Admission and Financial Aid, 2007.* B.A., Connecticut College. Dean of Enrollment, Sarah Lawrence College; Dean of Admission, Associate Director of Admission, Assistant Director of Admission, Admission Counselor, Sarah Lawrence College.

Andrew R. Dorantes, *Vice President for Administration and Finance/Treasurer, 2003.* B.S., MBA, California State Polytechnic University, Pomona; PhD, Claremont Graduate University. Adjunct Faculty Member, Azusa Pacific University; Adjunct Faculty Member, Claremont Graduate University; Partner, Capin Crouse LLP.

Jeffrey D. Groves, *Vice President and R. Michael Shanahan Dean of the Faculty and Professor of Literature, 1988.* B.A., University of La Verne; M.A., PhD, The Claremont Graduate School. Instructor, Harvey Mudd College; Freshman Division Director, Harvey Mudd College; Chair, Humanities and Social Sciences, Harvey Mudd College; Chair of the Faculty, Harvey Mudd College.

Timothy L. Hussey, *Assistant Vice President of Communications and Marketing, 2012.* B.A., Troy University. Senior Director, Communications and Marketing, Emory University School of Law; Web Managing Editor, Children's Healthcare of Atlanta; Director of Interactive Communications, Agnes Scott College.

Jon Jacobsen, *Interim Vice President for Student Affairs, 2015.* B.S., M.S., California Polytechnic State University, San Luis Obispo; PhD, University of Utah. Professor of Mathematics and Associate Dean for Academic Affairs, Harvey Mudd College; S. Chowla Research Assistant Professor, The Pennsylvania State University, Visiting Scholar inthe Faculty of Science, University of Alberta.

Daniel A. Macaluso, *Vice President for College Advancement, 2011.* B.S., Penn State University. Fundraising Consultant, Livestrong Foundation; Vice President for Development, University Programs, Campaign Co-Director, Emory University; Associate Vice President of Resource Development, Assistant Vice President for Fund Raising Programs, Executive Director of Corporate and Foundation Relations, University of Texas at Austin; Director of Development, Associate Director of Development, Penn State University, College of Agricultural Sciences.

Joseph Vaughan, *Chief Information Officer and Vice President of Computing and Information Services, 2008.* B.A., Trinity College, Dublin; C. Phil, M.A., University of California, Los Angeles. Director/Humanities CIO, UCLA Center for Digital Humanities; Chief Administrative Officer, Dodd Humanities Group, UCLA; Co-founder and Head of Studies, Piccadilly Idiomas, Madrid, Spain.

ACADEMIC CALENDAR 2015–2016

FALL 2015

Aug. 26, Wednesday	Residence halls open for new students; Orientation begins.
Aug. 30, Sunday	Residence halls open for returning students; first meal – brunch.
Sept. 1, Tuesday	First day of fall semester classes; Convocation 11 a.m.
Sept. 7, Monday	Labor Day – most offices closed, classes in session
Sept. 14, Monday	Last day to add full semester and first half semester courses (by 5 p.m.)
Oct. 2, Friday	Last day to drop first half semester courses; Last day to declare first half semester courses Pass/Fail (by 5 p.m.)
Oct. 16, Friday	Fall break begins after last class; first half semester courses end.
Oct. 21, Wednesday	Fall break ends 8 a.m.; second half semester courses begin.
Oct. 22, Thursday	Last day to drop full semester courses (by 5 p.m.).
Nov. 4, Wednesday	Last day to add second half semester courses (by 5 p.m.).
Nov. 17-20, Tuesday-Friday	Pre-registration for spring 2016.
Nov. 20, Friday	Last day to withdraw full semester courses with a grade of "W." Last day to drop second half semester courses; Last day to declare full semester course and second half semester courses Pass/Fail (by 5 p.m.).
Nov. 25, Wednesday	Thanksgiving recess begins after last class.
Nov. 30, Monday	Thanksgiving recess ends 8 a.m.
Dec. 11, Friday	Last day of HMC, CMC, and Pitzer classes (Pomona and Scripps classes end Dec. 9).
Dec. 14, Monday	Final examinations begin.
Dec. 18, Friday	Final examinations end; last meal – lunch.
Dec. 19, Saturday	Residence halls close 8 a.m.
Dec. 24, Thursday	Grades due to registrar by 5 p.m.
Jan. 4, Monday	Fall grades viewable on the portal.

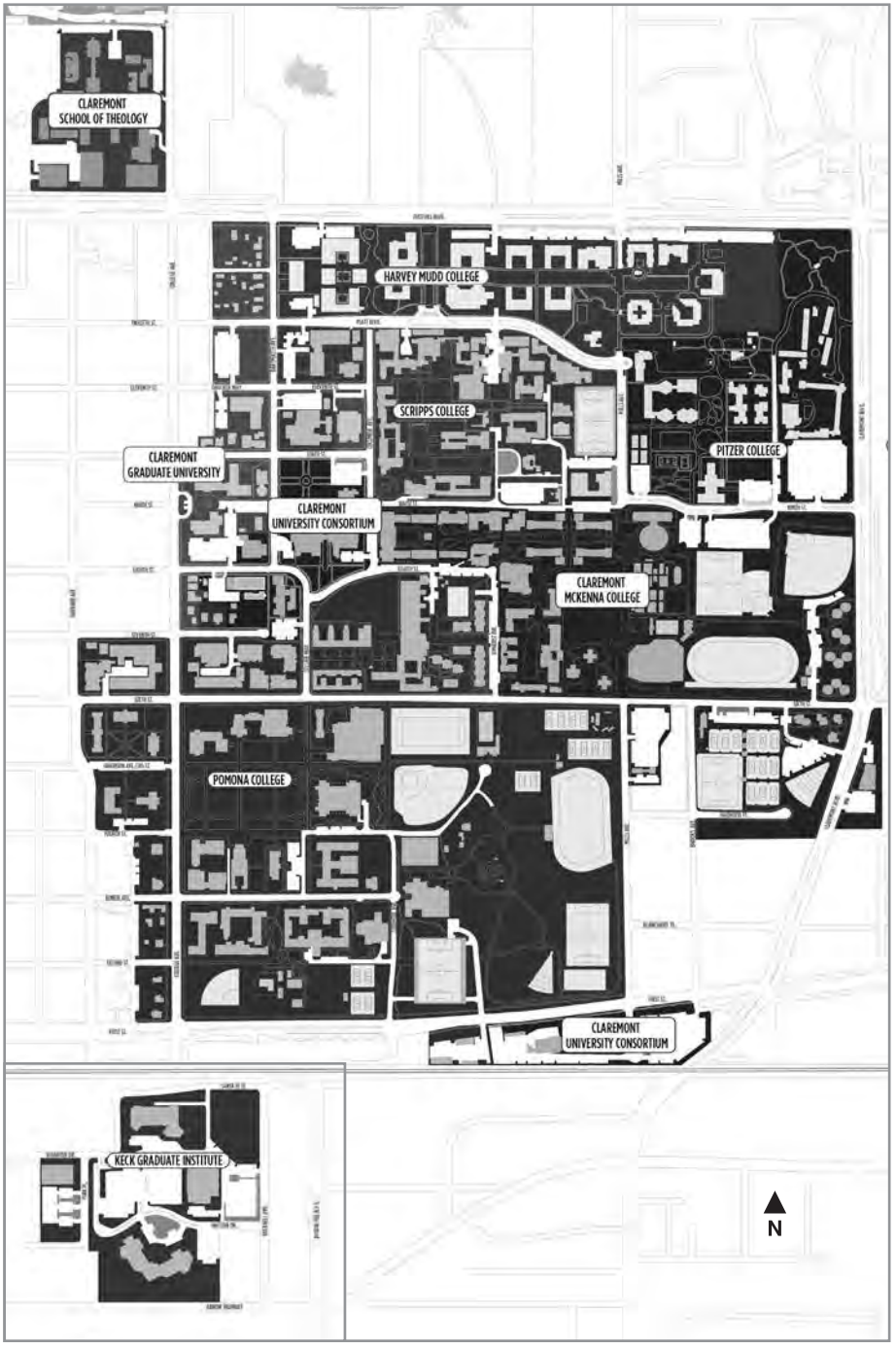
SPRING 2016

Jan. 17, Sunday	Residence halls open 8 a.m. for all students.
Jan. 18, Monday	Martin Luther King Day, most offices closed; first meal – brunch.
Jan. 19, Tuesday	First day of spring semester classes.
Feb. 1, Monday	Last day to add full semester and first half semester courses (by 5 p.m.)
Feb. 19, Friday	Last day to drop first half semester courses; Last day to declare first half semester courses Pass/Fail (by 5 p.m.)
March 4, Friday	First half semester courses end.
March 7, Monday	Second half semester courses begin.
March 10, Thursday	Last day to drop full semester courses (by 5 p.m.)
March 11, Friday	Spring break begins after last class.
March 21, Monday	Spring break ends 8 a.m.
March 25, Friday	César Chávez Day observed, offices closed; no classes.
March 28, Monday	Last day to add second half semester courses (by 5 p.m.).
April 15, Friday	Last day to withdraw full semester courses with a grade of "W." Last day to drop second half semester courses; Last day to declare full semester course and second half semester courses Pass/Fail (by 5 p.m.).
April 19-21, Tuesday-Thursday	Pre-registration for fall 2016.
April 29, Friday	Last day of HMC classes (CMC, Pomona, Pitzer, and Scripps classes end May 4).
May 2-4, Monday-Wednesday	Presentation Days; no HMC classes.
May 5-6, Thursday-Friday	Final exams for seniors; reading days for other students.
May 9, Monday	Senior grades due to registrar (by 9 a.m.).
May 9-13, Monday-Friday	Final examinations.
May 15, Sunday	Commencement at 1:30 p.m.; last meal – brunch.
May 16, Monday	Residence halls close 8 a.m.
May 19, Thursday	All other grades due to registrar by noon.
May 25, Wednesday	Spring grades viewable on the portal.


HARVEY MUDD COLLEGE

THE CLAREMONT COLLEGES

For driving directions to Harvey Mudd College, see **hmc.edu/map**



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